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CONTENTS

Death Takes a Holiday. *By Leslie Peat* ... 191
Business in Brief ... 193
Flywheel Production Practices. *By Joseph Geschelin* ... 194
Packard Replaces Twelve with a Custom Eight ... 200
Torkondif Is a Variable Continuously Transmission ... 202
Just Among Ourselves ... 205
Hudson Announces for 1940 ... 206
Cleaning Up the Rat's Nest Under the Cowl. *By Herbert Chase, M.E.* ... 208
Men and Machines ... 210
Mechanical Drawings of the Yellow Coach Four-Speed Transmission ... 213
News of the Industry ... 229
Advertisers' Index ... 86

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AUTOMOTIVE INDUSTRIES

Published on the 1st and 15th of the month

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Death Takes A Holiday

— *Insurance Rates Takes a Drop*

By LESLIE PEAT

So SHARP has been the reduction in motor vehicle accidents during the past 18 months that reductions of from 20 to 25 per cent, in addition to standard reductions to safe drivers, have been announced by the National Bureau of Casualty & Surety Underwriters, the rate-making association of stock companies in this field. A number of the larger mutual casualty insurance companies also have been publicizing lower rates for car insurance.

Thirty-five years of automobile insurance history has demonstrated that the automobile accident hazard is a human one rather than a mechanical one. All students of accidents will admit that mechanical equipment—whether it be faulty brakes, unguarded punch presses, or rickety household ladders—are a constant threat to longevity. But the combined experience of insurance companies has proved so clearly that a careful driver is a good risk that 32 leading stock companies are rewarding safe drivers to the tune of more than $6,000,000 a year in rebates and additional cash rewards.

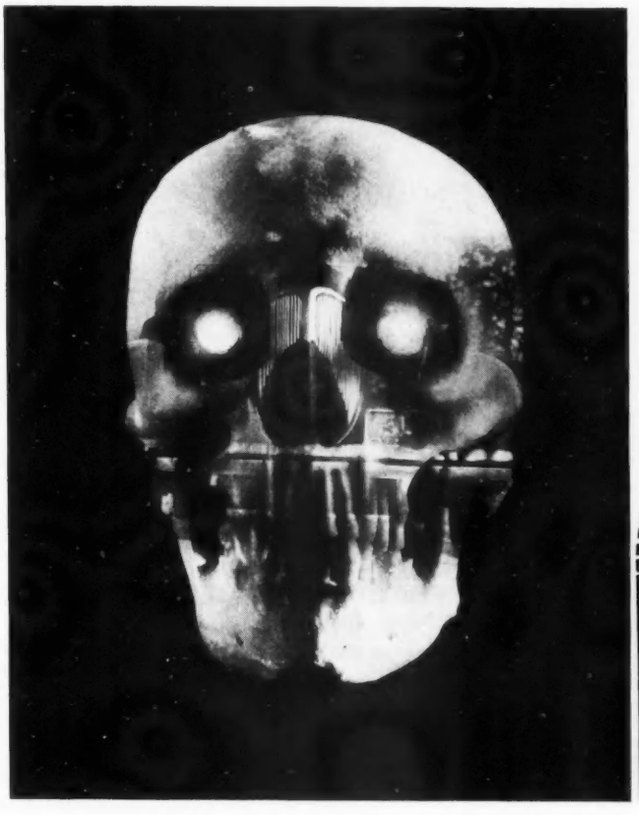
The National Bureau's premium reduction of from 20 to 25 per cent for insured motorists is being granted by member companies almost a year before schedule. The steady decline of accidents and deaths in which motor vehicles were involved since 1934, and particularly the 18 per cent decline in fatalities of 1938 as compared with 1937, has been the immediate cause of the latest insurance cost reduction. The insurance axiom that "the public make the rates" is again clearly justified.

The new reduction applies to rates on private passenger cars, and is based on use, mileage, and the number and age of those who operate the automobiles. The rate provides a reduction of 20 per cent in existing rate for passenger cars not used for business except for going to work and returning home. Cars must be owned by individuals rather than by firms or corporations. An additional 5 per cent reduction, bringing the total to 25 per cent, is provided for owners who do not drive more than 7500 miles a year, and further provided that not more than two members of the household drive the car, and that neither is under 25 years of age.

This reduction is in addition to the Safe Driver Reward Plan reduction which returns 15 per cent of the policy premium to the insured driver at the end of each policy year if the insured drives without being involved in an accident resulting in a loss.

The plan has been announced for 40 states and the District of Columbia, representing an aggregate of 76 per cent of the 1938 passenger registration. The only states not included are the following:

Louisiana, New Hampshire, New York, North Caro-



HIGHWAY SAFETY

lina, Washington, Virginia, Massachusetts, and Texas, which had a combined registration of 5,861,769 of the 25,261,649 total of the country in 1938. Insurance circles expect all of these remaining states to permit the extension of the new reductions, pending legislative adjustments which are required in the respective commonwealths. New York, with its 2,259,468 registrations in 1938, is expected to permit the new rate in the near future.

Automobile insurance history began in 1904, when there were more insurance companies in position to write casualty insurance than there were automobiles. In those days each insurance company set its own rates, using their teamsters' insurance schedules—the nearest available analogy—as a basis. No two companies had the same rate for the same make and model of car.

In 1914, when the total passenger car registration rose above the 500,000 mark for the first time, a separate automobile manual was published. This set up rates for various states, and a few of the larger cities were segregated at higher rates because of the higher accident hazard involved in city traffic. By that time manufacturers had standardized on the Society of Automotive Engineers' horsepower formula, and the SAE rating was used for cars. A total of 45 separate horsepower classifications were used, the lowest being 16 hp., and the highest 65 hp. and over.

Although this was a great improvement for both the individual car owners and insurance men, there was a great deal of criticism because the schedules were complicated and the rates were high. An example of the cost of automobile insurance was cited recently by E. E. Robinson, secretary of the National Bureau of Casualty and Surety Underwriters, who pointed out that in 1914 the most powerful passenger car on the market cost $136.69 to be insured in Omaha, Neb., as compared with a rate of $51 for today's most powerful car, which under the Safe Driver Reward Plan is reduced to $43.35, and under the further reduction just anounced comes to $32.51. The coverage offered in 1914, moreover, was far narrower than that provided today.

The first important reduction in automobile insurance rates came when the insurance companies realized that the driver, rather than the car itself, was the hazard. Through the bureau, the agency of all stock casualty companies, reports of accident-prone drivers were compiled and distributed to all member companies, and insurance was refused these drivers. This lowering of the rate multiplied the amount of insurance sold, and each successive reduction, based on the careful selection of the insured, brought further reductions.

The horsepower classification of 1914 was abandoned in 1918, when a rate based on the list price of the car was adopted as the sole basis for calculating insurance rates.

In 1920 this price basis was abandoned for a more complicated one, in which shipping weight, wheel-base, SAE horsepower, and cylinder displacement were considered. All passenger cars were classified under this plan under the symbols of W. X. Y. and Z.

In 1921 this classification was amended to include the factor of list prices. In those days the theory was that the horsepower and displacement were an index to speed; that shipping weight and wheel-base were a clue to the comparative manoeuverability or ease of handling a car in traffic; that horsepower and weight were an index of the comparative destructability of cars involved in an accident; and that list price was an indication of the financial worth of the car owner. This factor was of great importance in those days and influenced persons sustaining bodily injury or property damage in deciding upon the amount of claims for damage.

Underwriters found that when a pedestrian was knocked down by a car, his first rational act was to note the make of the car that hit him. If it was an expensive automobile, he instantly made up his mind that the owner was well-to-do and would be good for a substantial damage claim. If the car was a Model "T" Ford with loose fender waving in the breeze, patched with parts from a five-and-ten-cent store, and in general disrepair, he decided then and there that he would be lucky to get a modest reimbursement—if anything at all—for the actual cost of medical treatment. Sta-

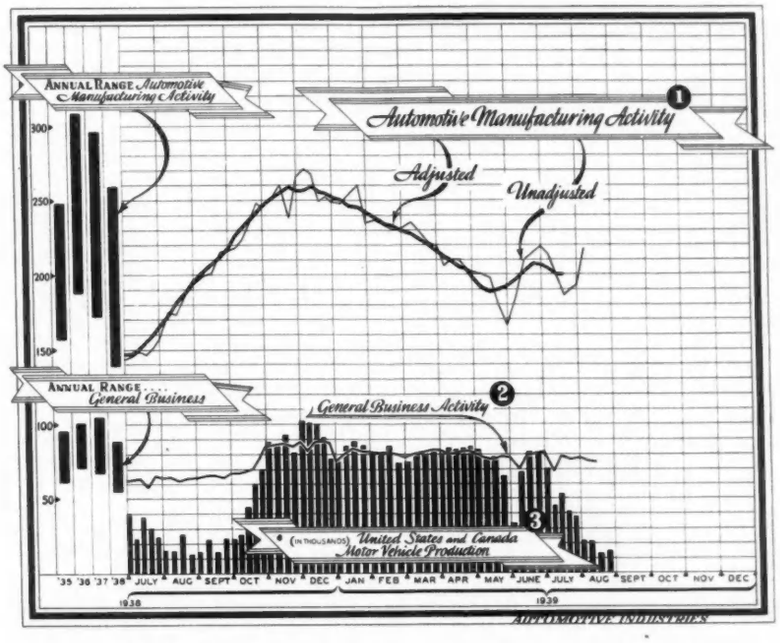
(*Turn to page* 226)

The Brass-Hat Rack

"—but all the other companies use pretty girls for their new model publicity pictures!"

BUSINESS IN BRIEF

Our own view of automotive production and sales; authoritative interpretation of general conditions



Weekly indexes of automotive general business charted

Big Production Awaits "Big Three"

PRODUCTION of passenger cars and trucks during the last two weeks of August brought the total for the month to an estimated[3] total of 85,000 units, with the week ending Aug. 26 accounting for 15,000 and the production week ending Aug. 31, for slightly more than 17,000. It should be pointed out, however, that the total is "tentative" inasmuch as the estimated figures are based on data collected a week before our publication date. Manufacturers beginning their runs on new passenger car models require several weeks to get assembly lines running smoothly so that initial schedules represent marks to shoot at rather than actual accomplishment.

Producers well underway in August included Packard, Hudson, Nash and Studebaker, while Buick, Pontiac, Plymouth, Dodge and perhaps one or two others expected to have final assemblies coming off the lines at fairly good rates at the end of the month. Although the industry as a whole was from three to four weeks ahead of 1938 on its new models, production totals will not reach higher levels until the volume producers—Ford, Chevrolet, and Plymouth—get into full swing, which probably will not be until the latter part of September.

AUTOMOTIVE MANUFACTURING ACTIVITY, as indicated by the unadjusted index[1], continued upward to 193 for the week ended Aug. 5 and to 217 for the week ended Aug. 12. The lagging chart of adjusted[1] index figures dropped to 200 for the week ended July 15 and remained at this level for the week ended July 22.

[1] 1923 average = 100; [2] Prepared by Administrative and Research Corp., New York. 1926 = 100; [3] Estimated by J. A. Laansma, Detroit News Editor, AUTOMOTIVE INDUSTRIES. [4] Summarized for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co. of New York.

GENERAL BUSINESS ACTIVITY[4] persisted in maintaining healthy advances despite the increasingly threatening aspects of European political developments. The index of the *Journal of Commerce* for the week ended Aug. 12 rose to a new 1939 peak of 90.3, as against 88.6 for the preceding week and 77.6 a year ago.

The movement of railway freight registered a further slight increase during the week ended Aug. 12. Loadings totaled 665,197 cars, or 0.6 per cent more than in the preceding week and 12.8 per cent more than the comparable 1938 number.

Electric power production during the same week, slightly above that of the week before, was 9.4 per cent greater than a year ago.

Crude oil production during the week ended Aug. 12, reflecting chiefly curtailment in Texas, dropped sharply to an average of 3,550,100 barrels daily, as against the all-time peak of 3,909,400 barrels in the preceding week. Daily requirements this month, as calculated by the Bureau of Mines, are 3,521,900 barrels.

Professor Fisher's index of wholesale commodity prices for the week ended Aug. 19 fell further to 77.8 per cent of the 1926 average, a new low point for the current year, as against 78.1 for the week before.

Reserves of member banks of the Federal Reserve system rose $124,446,000 during the week ended Aug. 16. Estimated excess reserves advanced $60,000,000 to $4,590,000,000, again establishing a new peak.

The General Motors-Cornell World Price Index of 40 basic commodities for the week ended Aug. 12 was 60.1, the same as the previous week's revised figure of 60.1. The United States index in gold increased 0.2 point to 61.3.

Flywheel Production

By JOSEPH GESCHELIN

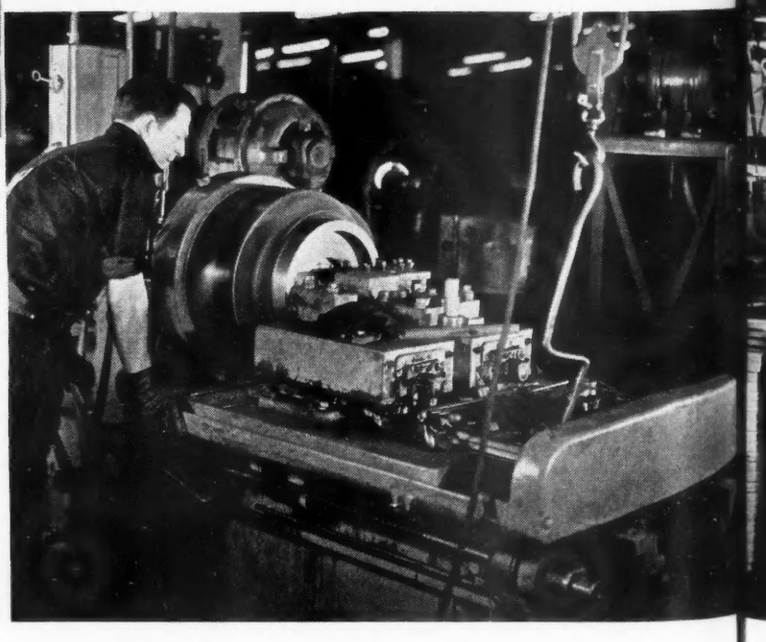
A THOUGHT provoking by-product of our present investigation of flywheel machining practice is the light shed on the predicament of the commercial engine builders whose basic engine models are amazingly complicated by optional variations. Speaking of flywheels alone, one of the engine builders produces no less than 3000 different wheels, another has 1500 variations, while a Diesel specialist with a relatively small number of basic models is confronted with 250 wheel specifications.

While not properly within the scope of this survey, it appears rather apropos to note this seeming complexity and to inquire whether or not it would be a constructive move to effect some degree of standardization or more properly, simplification, of those elements that contribute to the variations in flywheel design. If such standardization could be accomplished, within reasonable limits, not only would it simplify the manufacturing problems of the engine builders but would lead ultimately to further cost economies.

(Left) At Buick, flywheels are statically balanced on this GMR balancing machine

It is gratifying to note that as a result of a conscious selection of engine builders, this survey cuts a cross-section of the three basic manufacturing problems — *mass production,* where only one basic wheel is produced on a single purpose machine line; *moderate volume,* where only a few wheels are routed over a flexible, unit-type machine line; and *multiple-lot* production, where a large variety of wheels go over the same line.

A realistic analysis of practice shows unmistakably that flexibility of equipment, tooling, layout, and production thinking is the underlying basis for a sound mul-



(Below) One of the flexibly tooled Gisholt Simplimatic flywheel machines in use at the GM truck plant

This is the Forty-first in the series of monthly production features

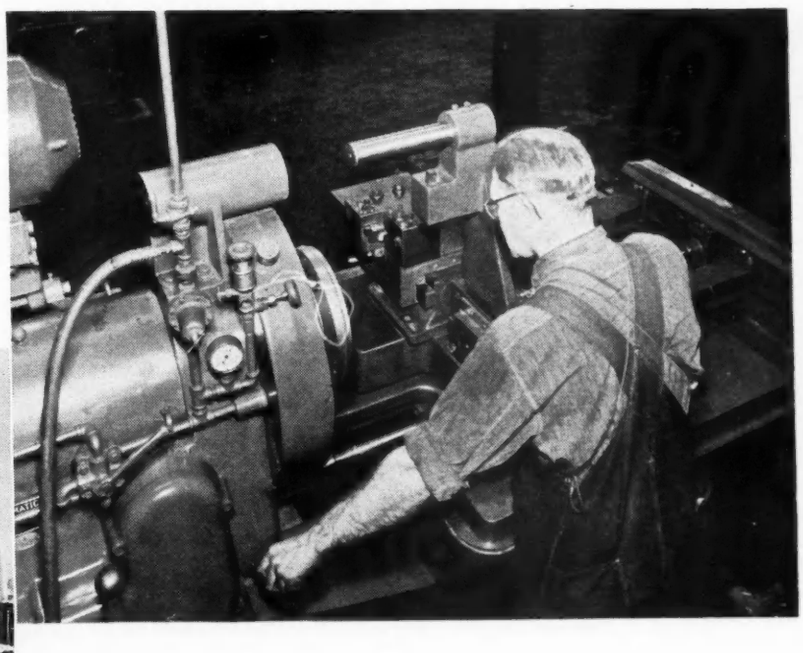
Practices

from all types of automotive plants cutting a cross-section of three basic manufacturing problems

tiple-lot machine set-up. Without this basic philosophy it would be a hopeless task, indeed, to cope with the endless variations in detail, within the limits of reasonable costs.

From the viewpoint of engineering design there exists the possibility of contributing to simplification by developing a minimum number of basic sizes and forms capable of accommodating the minor variations of hole spacing, hole size, etc., required for individual users. Too, we are impressed by the comment on practice at Minneapolis-Moline to the effect that in the original design, the machined surfaces and fillet radii are so developed as to permit the use of a single specially formed tool which can handle all of the operations merely by clamping at the proper angles in the tool holder.

While it is true from a metallurgical viewpoint that the flywheel is generally produced from ordinary good cast iron, it is likewise true that the material must have special quality to assure unfailing resistance to the unusually high stresses imposed by the centrifugal forces developed at high rotative speeds. For this reason, designers specify a good grade of gray iron possessing inherent density and soundness. During the course of this investigation we were impressed with the fact that only a certain few of the well-known foundries are considered flywheel specialists. Packard, which operates its own foundry, has run repeated tests to destruction at high rotative speeds to assure the metallurgical quality of its flywheel metal. From experience they have found that the requisite soundness and density are assured by holding Brinell hardness at 180 which, incidentally, is the basis for the routine acceptance test.



(Above) One of a battery of Gisholt Simplimatic lathes in the flywheel department of the IHC engine plant at Indianapolis

(Left) Drilling flywheel bolt holes at Caterpillar on a No. 30 Natco 12-spindle drill

Precise balance of the flywheel has become of paramount importance what with the demand for higher speeds and smoother operation particularly in heavy duty industrial service. Balancing practice varies as may be noted from the routings. In many cases the wheels are statically balanced, in other cases, they are balanced dynamically, or both statically

Buick Factory Flywheel Routing

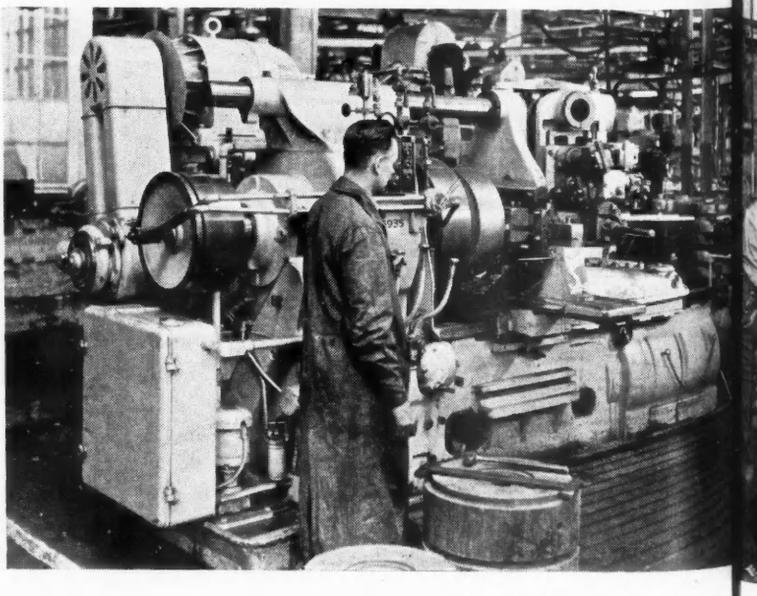
OPERATION	EQUIPMENT
Rough machine clutch side, turn over and rough crank side	12 in. 8-station Bullard Mult-Au-Matic
1st chucking 1st station	
Load	
1st chucking 3rd station	
Rough turn outside diameter, rough clutch cover clearance, break scale 2 places on clutch face, rough crank bolt recess, diameter rough bore pilot hole	
1st chucking 5th station	
Rough face clutch face, rough face bolt recess, semi-finish recess diameter and rough face rim	
1st chucking 7th station	
Semi-finish turn outside diameter	
2nd chucking 2nd station	
Load	
2nd chucking 4th station	
Rough turn ring diameter, rough bore locating diameter, rough radii at crank face, and web, second rough pilot hole, rough marking angle	
2nd chucking 6th station	
Rough face rim on crank side, rough face web, rough face crank face, rough face ring seat	
2nd chucking 8th station	
Chamfer near ring seat, finish bore locating diameter, finish turn ring diameter and undercut, finish face ring seat, semi-finish face marking angle	
Inspect	
Heat flywheel ring, shrink on flywheel, blow off water and dry wheel assembly	Buick gas furnace
Semi-finish clutch and crank sides, bore pilot and locating diameter	12 in. 8-station Bullard Mult-Au-Matic
3rd chucking 1st station	
Load	
3rd chucking	
Finish face angle at outside diameter, form radius at clutch cover clearance diameter, chamfer pilot hole, bore pilot hole, semi-finish, finish face and form radii at bolt recess, semi-finish face clutch face, finish turn outside diameter, semi-finish face rim, finish turn clutch cover clearance	
3rd chucking 5th station	
Finish face clutch face, finish face rim	
3rd chucking 7th station	
Finish bore crank pilot hole	
4th chucking 2nd station	
Load	
4th chucking 4th station	
Finish form radii at crank face and web, form radius at locating diameter and rim	
4th chucking 6th station	
Finish face crankshaft face, finish face rim, chamfer crank pilot hole, finish face marking angle	
4th chucking 8th station	
Drill crank bolt holes and 6 clutch cover holes	
Ream 8 holes, countersink 6 crank bolt holes on crankshaft side and burr 6 clutch cover holes on clutch side	21 in. Cincinnati Super Service drill Thor high frequency drill
Drill, counterbore and tap and burr 6 clutch cover holes on clutch face side	Kingsbury multi-spindle automatic indexing machine
Load	
1st position	
Counterbore 2 holes for crank bolts	
2nd position	
Drill 1 hole on angle	
3rd position	
Tap 2 holes for cover	
Hand ream pilot hole	Bench
Static balance	GMC balancing machine
Inspect	
Press timing marks on flywheel	Martin roll marking machine

and dynamically. In passenger car practice the entire assembly of crankshaft, flywheel and clutch is balanced dynamically after each of the individual units has been separately corrected.

In general, flywheel balance is being held to the extremely fine limits of 0.2 oz.-in. to 0.5 oz.-in., regardless of size or weight, with a top limit of 1 oz.-in.

Beyond question, one of the most significant advances that has been made in the manufacturing process is the almost universal adoption of induction heating for shrinking-on of the starter ring gear. In contrast with the older methods of heating by the torch or furnace, which took from six to ten minutes of time, induction heating is accomplished within a space of but a few seconds. Moreover, some of the older methods involved the danger of changing the metallurgical character of the ring whereas the new method with its almost instantaneous application of heat leaves the structure unchanged to all intents and purposes.

In passenger car practice where only one wheel or at the most, from two to four wheels are required, it is common practice to set up mass production lines using unit-type equipment which is single-purpose during the course of a season but may be readily retooled



Potter & Johnston heavy duty lathe, one of a battery, on the flywheel machine line at Caterpiller

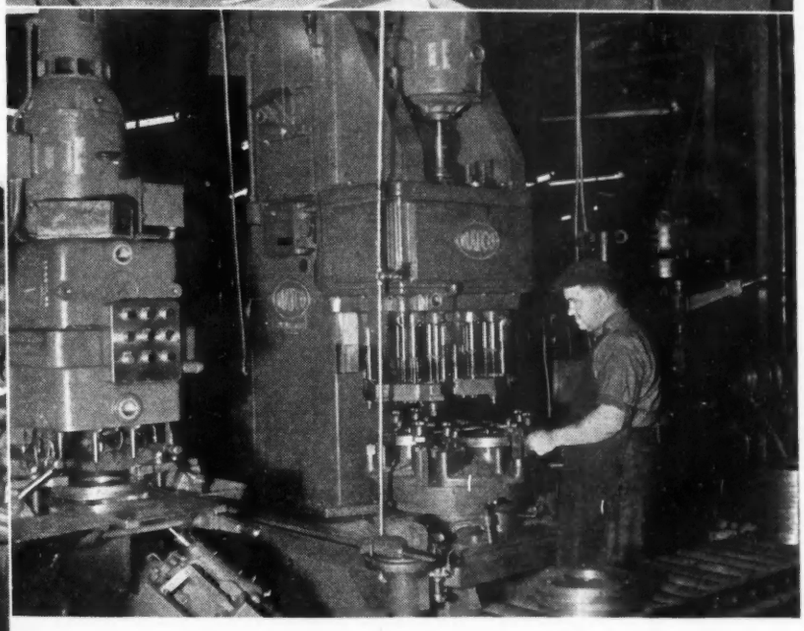
for any seasonal changes in design.

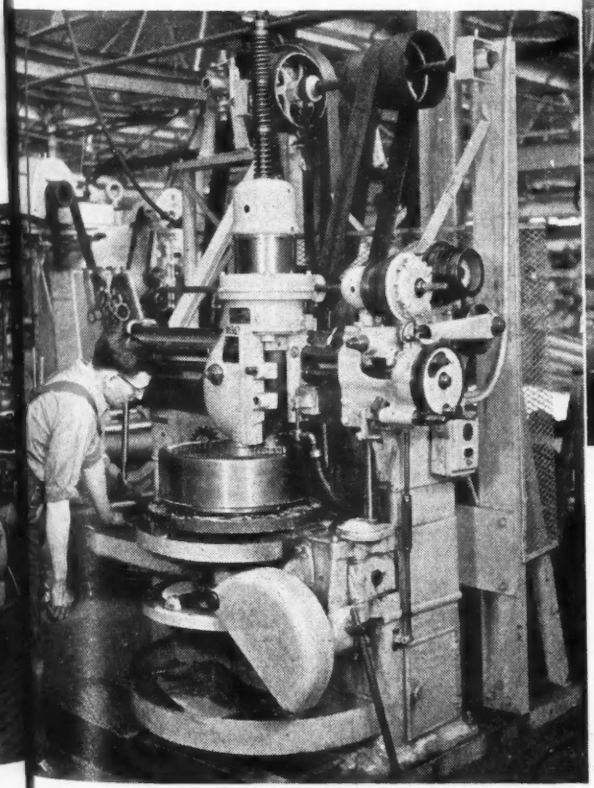
In commercial engine building establishments where flexibility is the major consideration, it is common practice to establish a number of machine lines based upon a sound classification of product. Here it is expedient first to divide the basic wheels into two categories—high production and multiple-lots; then to subdivide according to the range of diameters and thicknesses and weight. Generally speaking, it is essential, in the interest of good economy, to schedule wheels in such fashion as to reduce the frequency of tool changes, except in emergencies.

Many clever devices are employed to provide flexibility of changeover with the universal types of equipment available today. Apart from skillful tool design contributing to rapid and painless changeover from one job to another, the simple geometrical form of the wheel makes it a natural for chucking, permitting the use of interchangeable chuck jaws which accommodate differing wheel diameters without loss of set up time.

On the evidence of the routings, it may be seen that certain types of equipment are most widely used for the primary turning operations—Bullard Mult-Au-Matics and Contin-U-Matics and Gisholts for mass production; Gisholts and Potter & Johnston's for multiple-lot production, the latter being widely used for heavy-duty work. Particular note should be made of the fact that Bullard has installed several new batteries of its large flywheel turning machines in important passenger car plants whose identity is held confidential at the moment and consequently cannot be mentioned here.

Finish and dimensional accuracy have become of vital importance. Reference to the routings will show that in a number of cases, the clutch contact face is finished by surface grinding or finish-turned on Heald precision equipment. A new development in this field

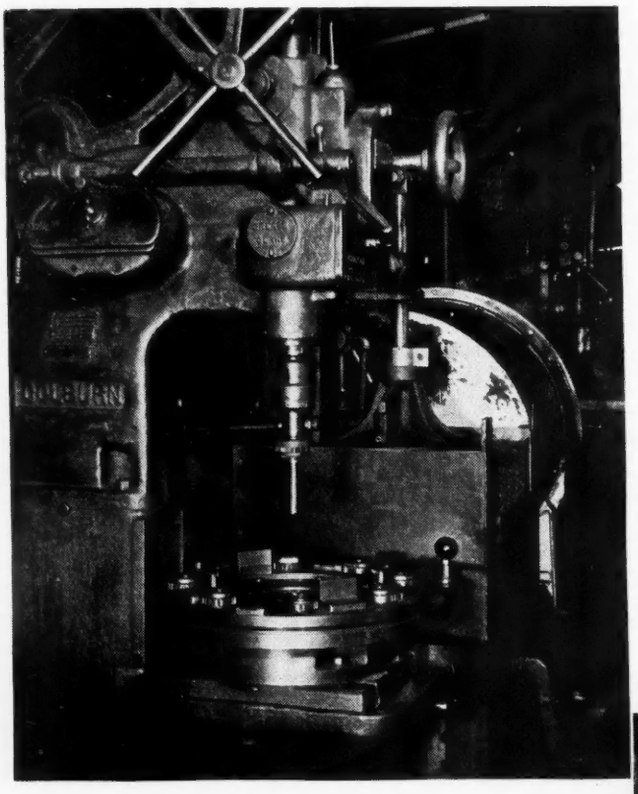




(Top) Flywheel ring gear is assembled on Chrysler flywheels with the aid of the induction heater shown here

(Above) Special Natco 3-position, rotary table drill on the Studebaker flywheel line. It is used for drilling and finish-reaming crank bolt holes, drilling screw holes

(Left) Special Fellows spur gear shaper cutting flywheel starter gear teeth at Caterpillar



This survey covers the practice of some 12 engine builders representative of every phase of the industry. Most important contribution is the publication of official factory routings giving the sequence of operations as well as a description of the machine on which the operation is performed. This is supplemented by brief notes on each of the flywheels.

The pictorial section also will be of great interest to our readers, covering as it does a complete cross-section of outstanding items of equipment in each of the many contributing plants.

We believe that this study should be of value to production men and engineers as a guide to current practice. We hope, too, that it will stimulate the equipment suppliers to a sympathetic appreciation of the serious problems inherent in modern multiple-lot production.

(Left) Colburn single-spindle drill press is used on the Packard flywheel line for reaming

(Below) One of a battery of Gisholt Simplimatic lathes used for turning flywheels at Waukesha

is the adoption of Superfinish for the clutch face, as for example in the case of Chrysler.

Drilling and tapping is done with multiple-head or single-spindle drills depending upon volume of production. For the special drilling required in great variety in most establishments, different devices are employed, one at Buda being worthy of special comment. Here they have developed a universal work-holding fixture fitted with an indexing attachment, supplemented with a drill jig bushing bracket which can be readily moved up and down to accommodate differences in diameter. By this means, it is possible to service an endless variety of special holes in the flywheel periphery.

Studebaker Factory Flywheel Routing

OPERATION	EQUIPMENT
Rough drill center hole	No. 321 Baker drill
Rough face clutch face, rough and finish turn half of outside diameter, chamfer outside diameter, rough and finish bore and face oil slinger groove	Gisholt Simplimatic lathe
Rough and finish face front face, rough turn gear diameter, rough face and bore crankshaft counterbore and finish bore center hole	Gisholt Simplimatic lathe
Finish bore crankshaft counterbore	No. 3A Warner and Swasey
Finish face clutch face and finish turn ring gear fit	LeBlond lathe
Polish clutch face	Crawford polishing machine
Load and stamp "C" on clutch face, drill and finish ream crank bolt holes and drill screw holes	Special Natco 3-position rotary table drill
Drill angular oil holes and tap clutch screw holes	Special Greenlee drill and tapper
Stamp timing marks	No. 4 Toledo press
Shrink gear on flywheel, burr and ream crankshaft counterbore	Calorac electric ring expander and fixture
Press in bushing and burnish, chamfer crank bolt holes and paint timing mark	Studebaker air press
Balance and drill for balance	Micropoise balancing machine

Minneapolis-Moline Factory Flywheel Routing

OPERATION	EQUIPMENT
Turn, bore, ream, face and undercut	24 in. Bullard lathe
Finish turn other side	24 in. Bullard lathe
Drill 8 holes	B16 Natco multiple drill
Tap 8 holes	9 in. column Carlton radial drill
Balance	18 in. Gisholt static balancer
Broach and stamp timing marks	XA Oil-Gear broach
Shrink on starting ring	Hand operation from immersion heating pot

Allis-Chalmers

The brief routing on page 220 covers the set-up for one of the flywheel lines which is tooled for a single wheel. Although this is essentially a single purpose machine line, the equipment is flexible and tooling so designed as to accommodate any wheel within the capacity of the machines.

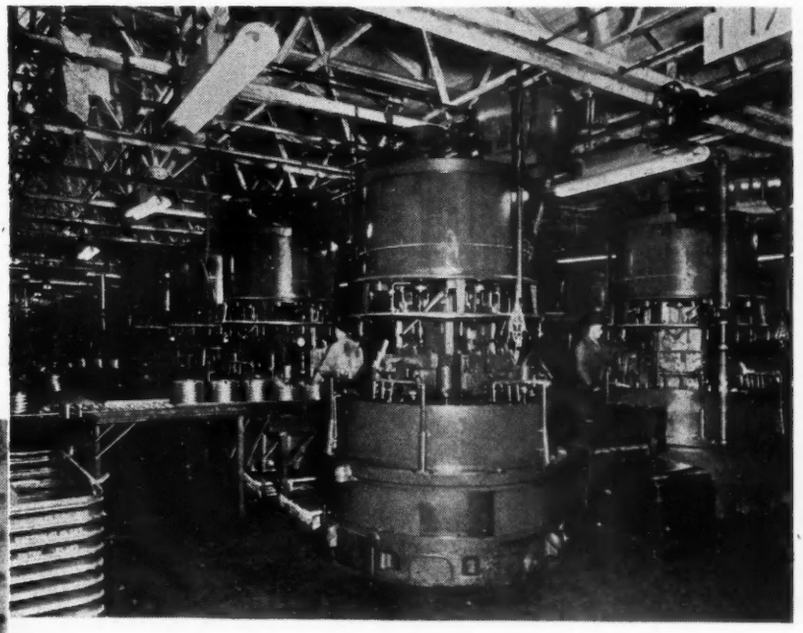
The wheels are statically balanced within 2 oz.-in., making correction in a plane at 90 deg. to the crankshaft center line. There is a process inspection on the line and final inspection after the starting gear is applied.

Buick

A basically mass production machine line is used for the manufacture of Buick 40 flywheel. The big Bullard Mult-Au-Matics are used for both rough and finish turning operations. Roughing on both sides is performed on 12 in. 8-station double index Bullard Mult-Au-Matics, a coolant being used to keep the wheels at low temperature while machining. The ring then is assembled using a Buick gas furnace, holding approximately 15 rims for heating and a Buick air-operated fixture to hold the assembly while cooling.

The assembly is finished on both sides on the same type Bullard machine as the roughing operation, the clutch face being finished with a single point tool. This surface must be smooth and less than 0.004 in. run-out at a 5-in. radius. The crank pilot hole is bored

(*Turn to page* 214, *please*)



(Right) General view of a large battery of Bullard flywheel turning machines recently installed in one of the newest engine plants

(Below) Cummins has installed this new American radial drill in the flywheel line for drilling all holes

Cummins Engine Co. Flywheel Routing

OPERATION	EQUIPMENT
Face and turn engine side complete. Turn outside diameter. Form all undercuts, radii and bevels. Bore center hole	No. 4A Warner and Swasey Index turret lathe
Face and turn clutch side complete. Bore all diameters and recesses. Smooth clutch face, form all radii and stamp part number.	Bullard vertical turret lathe
Lay out miscellaneous holes not jigged	
Drill all holes. Stamp part number, zero and timing mark	American radial drill
Balance	Hi-Eff balancing machine
Assemble starter gear	

Packard Replaces Twelve with a Custom

Of four series in the new line, eights. Larger two eights have

PACKARD'S offering for the 1940 season comprises the following four lines: Series 110, the Six, with 122-in. wheelbase; Series 120, an eight with 127-in. wheelbase; Series 160, the big straight eight (replacing the former Super Eight), with wheelbases of 127, 138 and 148 in., and the Custom Series 180, with substantially the same chassis as the Series 160. which replaces the former Packard Twelve.

In front-end styling and in eye-appeal features generally, Packard accents the modern trend without departing from its characteristic lines. Front-end appearance has been changed by the introduction of much narrower front grilles, supplemented by two die-cast side grilles. The radiator shell has softer lines, relieving the customary sharp edges, with a gracefully-rounded nose molding into the narrow grille. Hoods taper to the narrow shell; they feature a wide-tapering center panel with side-lifting side panels.

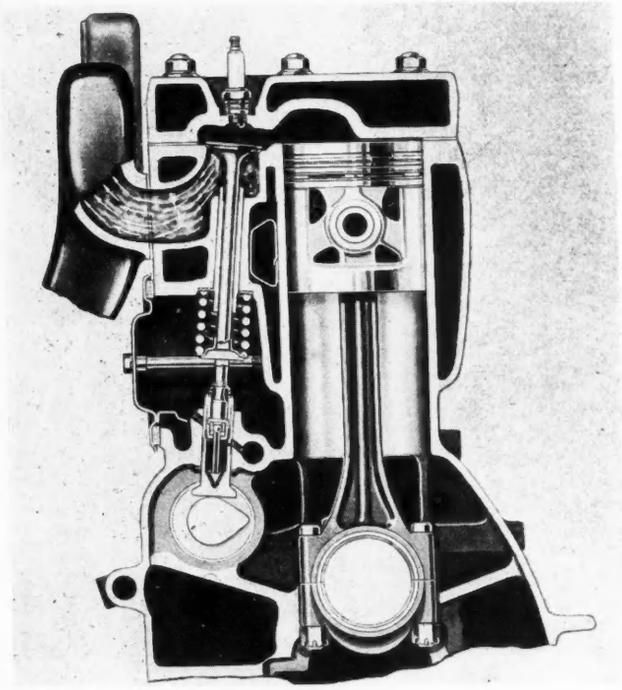
Radiator grilles are finished in chromium plate, and the front grilles are encased in a bright chrome frame. The headlamps, which are mounted between the fenders and shell without the use of brackets, are supplemented by die-cast, fender-mounted parking lamps.

Basic engine specifications are as follows:

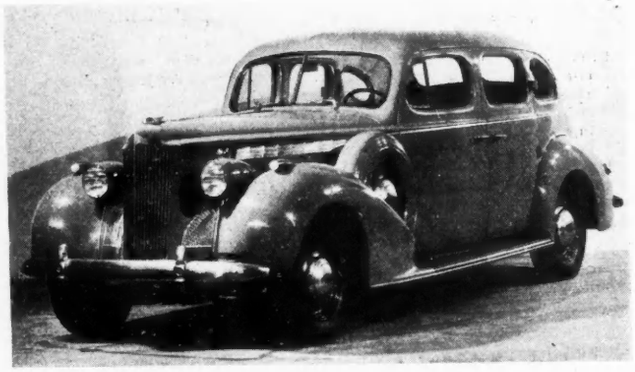
Series 110, L-head, six-cylinder, 3½-in. bore by 4¼-in. stroke, 245-cu. in. displacement, rated 100 hp. at 3200 r.p.m. with the standard compression ratio of 6.39. Optional compression ratio, 6.71.

Series 120, L-head straight eight, 3¼-in. bore by 4¼-in. stroke, 282-cu. in. displacement, rated 120 hp. at 3600 r.p.m. with the standard compression ratio of 6.41. Optional compression ratio, 6.85.

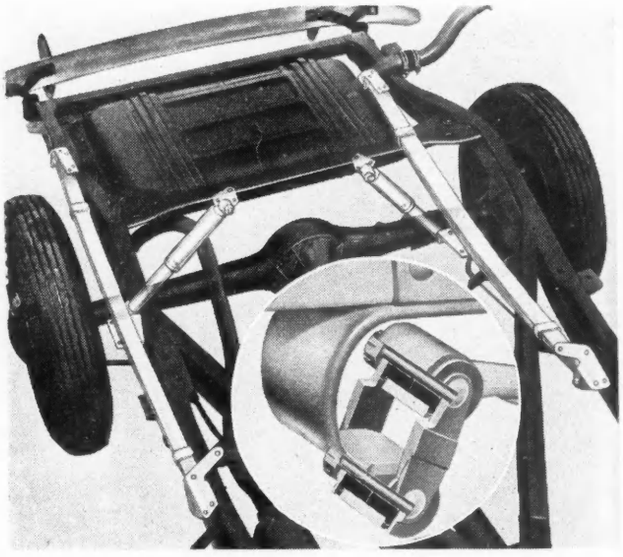
Series 160, L-head straight eight (replacing the former Super-Eight engine), 3½-in. bore by 4⅝-in.



Transverse section through new engine with zero-lash tappets



Three-quarter front view of Packard 1940 four-door sedan



Rear end of short wheelbase chassis and detail of tension-type spring shackle

Eight

one is a six and three are the same new engine

Showing new front-end treatment of 1940 Packards

stroke, 356-cu. in. displacement, rated 160 hp. at 3600 r.p.m. with the standard compression ratio of 6.45. Optional ratio, 6.85. This engine is used also in the Series 180.

Many mechanical changes and refinements have been incorporated in the new series. All models have been gone over with the object of reducing weight, and in some as much as 200 lb. has been eliminated. This is said to have resulted in increasing the fuel mileage and, in combination with increased engine output, to give better performance. The front suspension remains the same, except for some detail changes, but rear suspensions have been improved.

The new 160 engine features the Wilcox-Rich hydraulic valve lifter, with an oil filter installation designed to handle the entire oil supply for the lifters. On the other engines this filter is available at extra cost. Generators are of 35-amps. capacity and have voltage-current regulation. Stewart-Warner electric windshield wipers are standard equipment on the 110 and 120. Stromberg carburetors with built-in automatic choke mechanism are standard. Convertible coupe models will feature a power-operated top.

A major mechanical change is found in the design of the overdrive, which is built by Warner Gear. The clutch and brake pedals are of the heavy pressed-steel type recently developed by A. O. Smith. Buyers are given the choice between a standard dash-type heater with defroster and an under-seat heater with a separate defroster. The defroster unit is arranged to provide, selectively, cold fresh air drawn in from the outside, or heated air, to the upper compartment.

The 110 and 120 engines remain substantially unchanged. The new 160 engine, which is said to be the most powerful eight-cylinder engine in the passenger-car field, is similar to the 120 engine in general. An important feature is the Wilcox-Rich hydraulic valve lifter, which incorporates a newly-developed steel barrel unit. The engine-lubrication circuit is so arranged that the oil filter, of the by-pass type, handles all of the oil that goes into the units and, consequently, acts as a by-pass filter for the rest of the engine.

The engine has a nine-bearing crankshaft carried in precision-type babbitt bearings. On the 110 and 120 the engine mountings remain unchanged, and similar mountings are used on the 160, with added capacity in front.

Another important development is a new cylinder head on both the 120 and 160, with a combustion chamber of improved form.

(*Turn to page 222, please*)

Torkondif is a Continuously

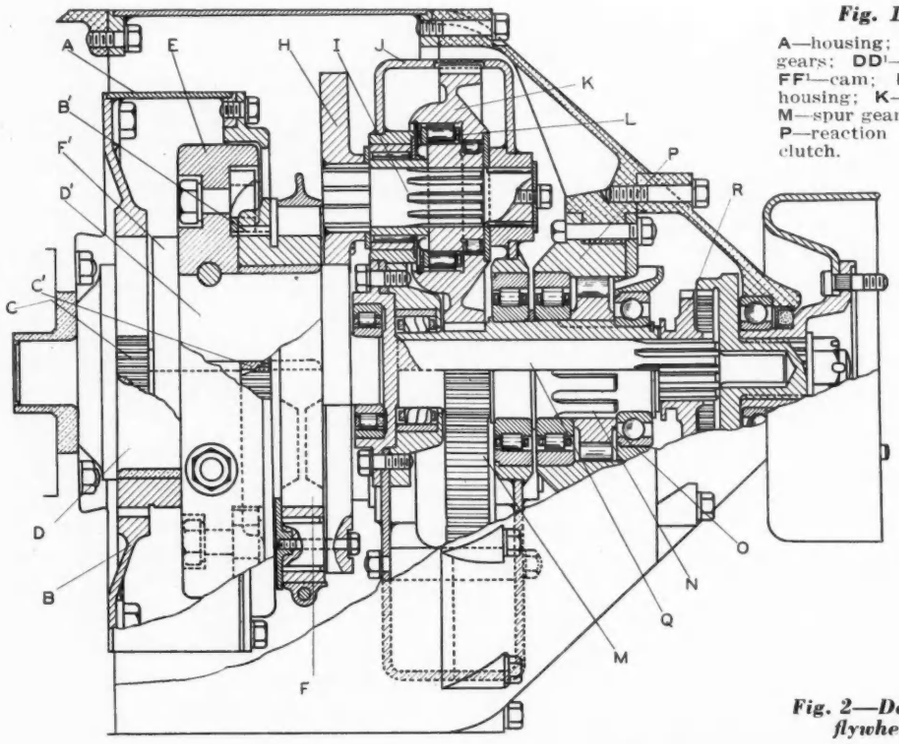


Fig. 1—Longtitudinal section

A—housing; BB¹—internal gears; CC¹—spur gears; DD¹—crankpins; E—inertia wheel; FF¹—cam; H—rocker lever; I—shaft; J—housing; K—gear wheel; L—roller ratchet; M—spur gear; N—tubular shaft; O—cam ring; P—reaction member; Q—central shaft; R—clutch.

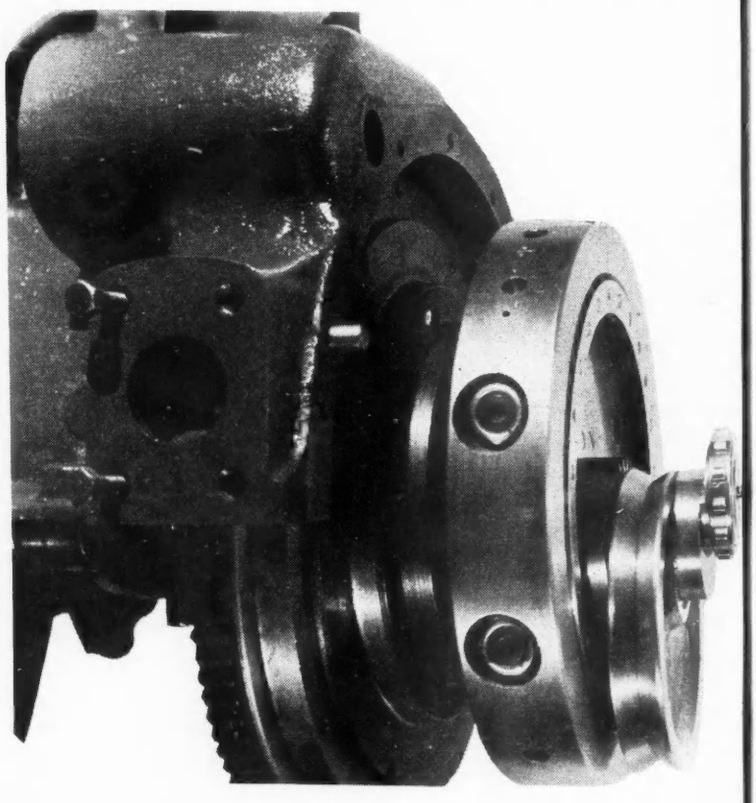


Fig. 2—Determinator on right and engine flywheel with starter gear at left

By P. M. HELDT

AN automatic, continuously variable transmission of the inertia-controlled, variable-throw type, known as the Torkondif, is under development by John W. Clerke of Hollis, L. I., N. Y. It consists essentially of three elements, all enclosed in a housing that is flange-bolted to the engine flywheel housing in the usual manner. First comes a unit known as the determinator, which automatically varies the eccentricity of an eccentric cam in accordance with the torque load on the output shaft and the throttle setting of the engine. Through the intermediary of this cam the engine imparts motion to a number of rocking levers. Then comes the proportionator, in which one phase of the motion of each rocking lever is transmitted to a planetary gear wheel, and through it and the sun gear to the housing of the planetary assembly; and finally there is a reaction member which holds the sun gear of the planetary assembly from turning counterclockwise when the torque impressed on the planetary gears tends to make it do so. Control of the transmission is by push buttons

Variable Transmission

It is inertia controlled and of the variable-throw type and consists of three major elements

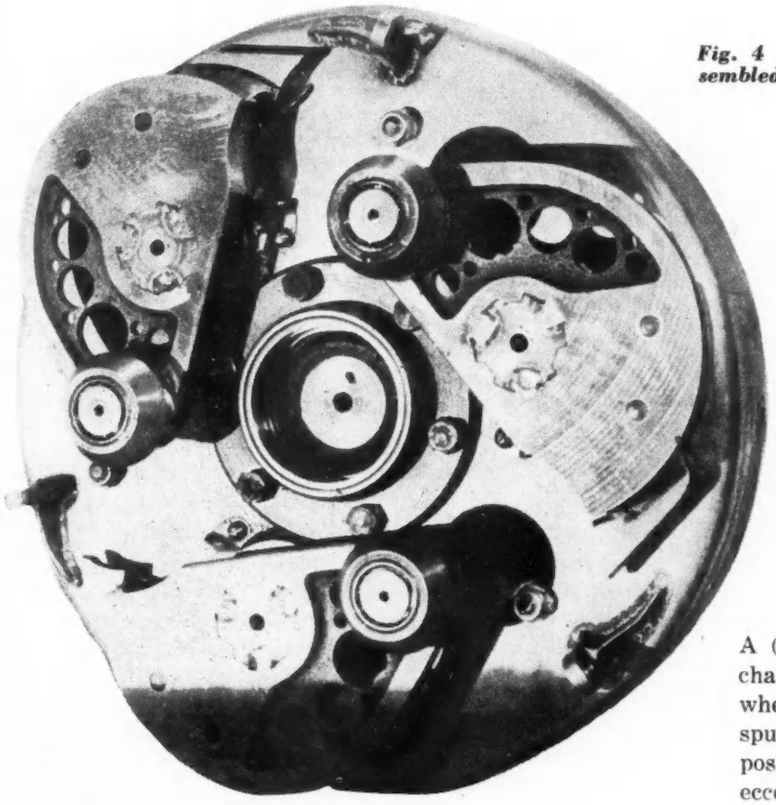


Fig. 4 — The three rocking levers assembled on the housing of the proportionator

through a solenoid. Pushing one button marked "Forward" sets the transmission for forward motion, while pushing another brings it back to the neutral position.

Fig. 1, herewith, is a longitudinal section through the transmission. Fig. 2 shows the determinator on the right, and the engine flywheel with its starter gear on the left. Fig. 3 is one of the rocking levers mounted on the shaft of one of the planetary gears, one arm of the lever being provided with a needle-bearing roller follower designed to contact with the cam of the determinator. In Fig. 4 the three rocking levers are shown assembled on the housing of the proportionator. In Fig. 5 the three planetary gears are shown assembled with their sun gear in the housing of the planetary assembly.

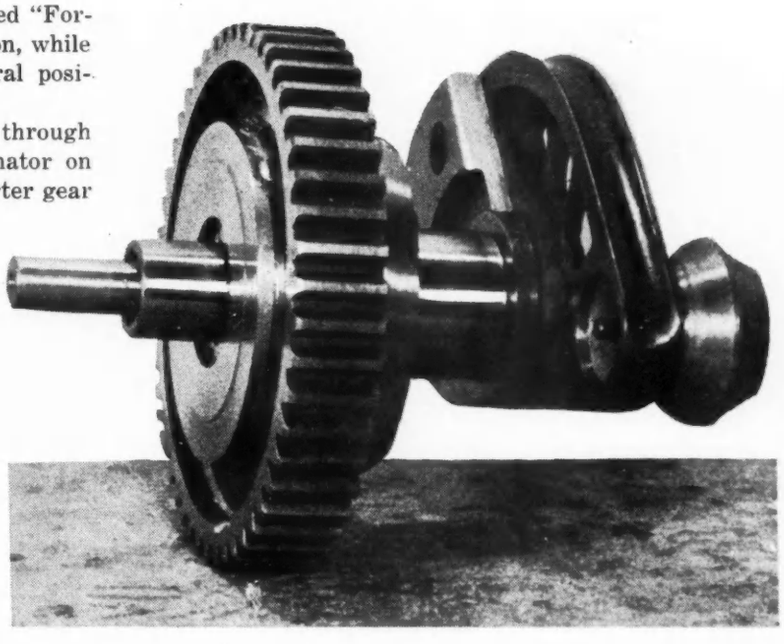


Fig. 3—Rocking lever mounted on shaft of one of the planetary gears

Referring to Fig. 1, housing A of the determinator unit is bolted to the engine flywheel and rotates with it. Internal gears B, B' are integral parts of this housing, and the power of the engine is transmitted through these gears to spur gears C, C' meshing with them. These spur gears are free to rotate on crankpins D, D' extending in opposite directions from the inertia wheel E which is concentric with the engine flywheel but is in driving relation with it only through the gears.

Gears C, C' are rigidly connected with cam F and its balancing cam F'. Stops are provided to limit the angular travel of the cams on the crankpins. It will be seen that any angular motion of inertia wheel E relative to housing A (and to the engine flywheel) will cause the cams to change their angular position relative to the inertia wheel, because of the interaction of the internal and spur gears. In Fig. 1, cam F' is shown in the neutral position. The cams are of eccentric form, and their eccentricity is equal to the crank radius of each of

the two crankpins D, D', so that in the neutral position the effect of the cranks is neutralized by that of the eccentrics, and the periphery of the cam is then concentric with the crankshaft axis. In this position, cam F' abuts against its stop. If now the inertia wheel is turned counter-clockwise, cam F' will be caused to turn on crankpin D; it can be moved through an arc of about 180 deg. and then ends up against the other side of the stop.

By thus moving the cam around its axis, the "throw" of the crank-eccentric combination is varied. With the cam in the neutral position and its periphery concentric with the crankshaft axis, there is no "throw" and no lever action, but if it is moved very slightly from this position it produces a "throw" of small magnitude, so that its leverage or mechanical advantage in overcoming any resistance encountered by it is very great.

The cam acts on a series of three rocker levers H which are held against it by means of springs (not shown in the drawings). These rocker levers are splined to shaft I, mounted in roller bearings in the housing J. Fig. 3 shows one of the rocking levers with its needle-bearing roller follower designed to contact with the cam, and with the planetary gear on whose shaft it is mounted. In Fig. 4 the three rocking levers are shown assembled on the housing of the proportionator. Between its bearings, shaft I carries a gear wheel K provided with a roller ratchet L of such design that it will transmit to gear K any clockwise rotation of shaft I, whereas counter-clockwise rotation of the shaft will not affect the gear. Thus the three gear wheels K are rotated in the clockwise direction by oscillations of their respective rocker arms H. Gears K mesh with the sun gear M formed on tubular shaft N. At its opposite end shaft N carries the cam ring O of the reaction member P which locks the shaft against counter-clockwise rotation. Therefore, when a turning moment is exerted on gears K by rockers H, since sun gear M is held from counter-clockwise rotation by the reaction member P, gears K roll on sun gear M in a clockwise direction and carry the housing J with them. The latter is flange-bolted to the central shaft Q, which can be coupled to the output shaft of the transmission by the gear-type clutch R that is controlled by the solenoid.

With the engine idling, cam F is held in the neutral position by springs on the rear ends of shafts I which force the roller followers of the rocker arms in contact with it. If now the throttle is opened and the engine accelerated, at a speed of 350-400 r.p.m. the inertia of the inertia wheel causes it to lag behind the crankshaft, and the resulting differential motion between housing A and inertia wheel E forces the cam from the neutral position. When only slightly away from the neutral position, the cam rocks the rocker levers through only a small arc once for each revolution of the crankshaft, and thereby causes the output shaft to turn through a very small arc. The result is a large reduction ratio, which enables the engine to readily overcome any resistance to its motion.

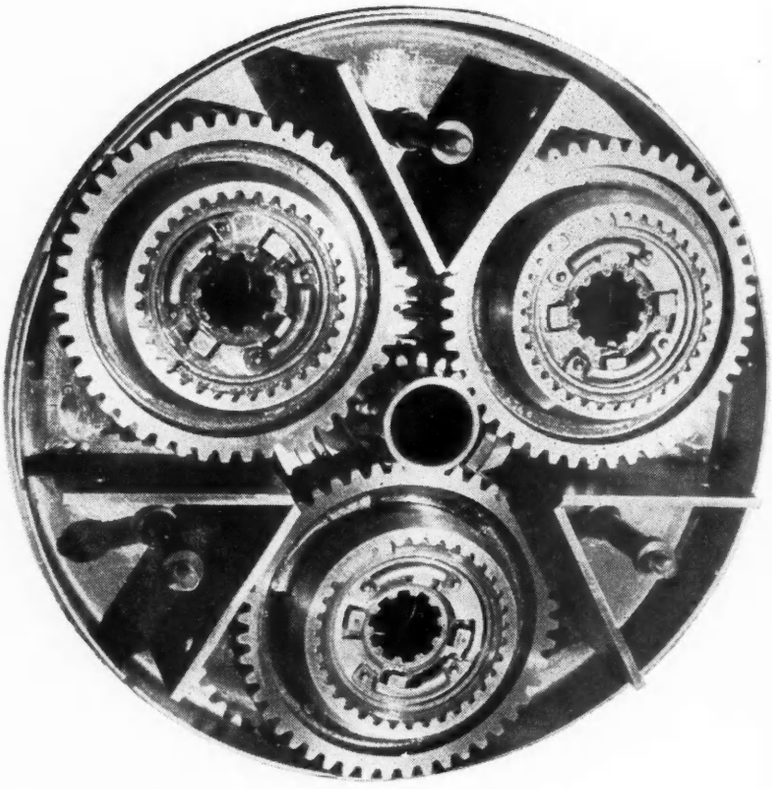


Fig. 5—Three planetary gears assembled with sun gear

As the throttle is being opened and the cams are forced away from their neutral position, they are subjected to centrifugal force, which tends to move them to their extreme outward position. However, such outward motion of the cams is resisted by not only the resistance to motion of the car, but also by its inertia, hence the "throw" of the crank-eccentric combination can change only gradually, as the inertia resistance decreases with increase of car speed. If during the accelerating period the torque load should become too great for the engine to carry for the position in which the throttle is set, the inertia wheel will run ahead of the engine crankshaft, thereby reducing the "throw" of the eccentric and preventing the engine from stalling

It is claimed that acceleration is quite smooth. Energy, of course, is transferred to the planetary gears in impulses, but the impulses received by the three gears are out of phase, following one another at intervals of 120 deg. of crank travel, and they probably overlap to a certain extent. As the car gets under way the drive ratio is decreased gradually and automatically. On the level roads this continues until the propeller shaft turns at nearly the same speed as the engine crankshaft. The cam then has reached its position of maximum "throw," and in this position it can no longer pass under the roller followers of the rocker levers, owing to stops provided on proportionator housing J. This locks the entire transmission, and thereafter the drive is direct.

To stop the car, the driver takes his foot off the

(*Turn to page* 227, *please*)

AUTOMOTIVE INDUSTRIES

Just among Ourselves

Of Verbiage, And Volunteers

THERE is, undoubtedly, an American language, distinguishable from the mother tongue as it is spoken in England, or Canada or Australia. And it is one of the richnesses of the American language that most of the professions, industries and trades have a vocational language of their own. Part of it is composed of the normal heritage of specialized technical words, more or less necessary in expediting the flow of thought and action in a particular vocation, insofar as it is distinguished from others. Sometimes one vocation will borrow a technical word from another. The word "trepanning," for example, describes a rather similar operation in removing a section from the top of the skull, or from the surface of a block of metal.

The formal, technical language of any profession is interesting. But even more interesting to some of us is the shifting, colorful, kaleidoscopic corpus of slang terminology which tends to grow into common use among the technical men in the industries which provide their daily bread and cake. Two of our associated publications, the *Automobile Trade Journal* and the *Commercial Car Journal*, have explored pretty thoroughly the linguistic pastures browsed over by the used-car salesmen, the automobile mechanic and the hack hands and tap dancers (whoa! we mean truck drivers and delivery truck drivers) who are employed in their bailiwicks.

A truck driver whose hands and face are dirtier than the average required by his job is likely to be called a 'goat herder' by the other boys, and the driver of a cattle truck is often referred to as a "cattle baron."

Truck drivers, a grand race of men, share the weakness of the rest of the human family of being comfortable only with people who "Talk their language." This, as we see it, is probably the basis of the ruddy nomenclature they have fastened on the objects in their daily experience. If he has to call these things by their normal names, he is uncomfortable. If he is where he can refer to them in his own language, a bond of fraternity is established, and everything is copasetic, or something like that, from there on.

Truck drivers are only an illustration. More than half of the readers of this publication are engineers, and certainly they show a tendency to go off into corners with the lads who specialize in the same brand of specialty as they do. It's the natural, the human thing. As a matter of fact, you should listen to a couple of editors talking shop. Editorial jargon tends to be obstetrical because of the editorial concern with the birth and death of great issues, some of which live as long as 24 hours.

To return to the automotive industry. We would like to know more about the special language which has grown up around the scores of specialized vocations in the field. We would like to collect it, sort it, define it and publish it for the benefit of the executives, the engineers, the salesmanagers, the production men, the advertising men and everyone else in the industry. We have in mind your amusement and education, and our own.

We hope that every reader of AUTOMOTIVE INDUSTRIES will search his mind for a list of the slang terms, the pet names, the technical jargon, which does not appear "in the book" anywhere, but which is a part of the everyday language of the industry, particularly the manufacturing part of the industry.

We hope that you will write, on a postcard, or in a letter to us, the results of your gleanings. The name of every person who submits a usable term and its definition will be credited in the magazine, unless such credit is requested to be withheld. Here are some sample definitions to give you an idea of what we want. They are taken from the April issue of *Automobile Facts*, a publication of the Automobile Manufacturers Association. "The big machines that perform extraordinary operations with accuracy and speed pop up with such names as Big Bertha, Player Piano, Percolator, Hay Bailer, Jack Rabbit and Corn Popper . . .

"A curl is put in steel rings by the Permanent Wave Machine. Coil springs are squeezed into place by a Robot. The Merry-Go-Round's spindles rise and fall, machining engine blocks that roll round its face . . .

"While the car's Tin Hat is worn on the rear axle the Hair Pin holds pedal springs in place. Besides the Dog Collar which proves to be a muffler clamp, there is a Belly Band supporting the transmission."

That gives you an idea of the kind of stuff we want. Right now wouldn't be too soon to begin sending it in to the undersigned.—HERBERT HOSKING.

New 1940 Hudson Six

FOR 1940 the Hudson Motor Car Company offers three lines of cars—two sixes and an eight—all sold under the Hudson name. Particular emphasis is placed on the Hudson Six, a new entrant in the lowest-priced field, in which a new style of upholstery and advances in performance, riding comfort and roadability are featured. The line also includes the Straight Eight and the Super Six, which are identical except for the powerplant. De luxe models are the Country Club Six and Eight sedans, which have deep-formed seats covered with a new type of upholstery cloth made especially for Hudson by Hockanum Woolen Mills. The Airfoam seat cushions, introduced last year, have been redesigned.

Hudson this year introduces independent front springing with "center-point steering" on all of its models. The hydraulic brakes have been improved by a redesign of the mechanical reserve linkage. Other new features include direction signals, increased front and rear vision, and a heavier frame conforming to the new-type of front suspension. The hinge of the dash-locking hood has been lowered. Overdrive is offered as an optional extra on all models.

The Hudson Six has a six-cylinder engine of 3-in. bore by 4⅛-in. stroke (175 cu. in.), rated 92 hp. at 4000 r.p.m. with a compression ratio of 7. The Super-Six with 118-in. wheelbase and the Country Club Six with 125-in. wheelbase have L-head engines of 3-in. bore by 5-in. stroke (212 cu. in. displacement) rated 102 hp. at 4000 r.p.m. with a compression ratio of 6.5. The eight-cylinder engine is an L-head of 3-in. bore and 4½-in. stroke (254 cu. in. displacement) rated 128 hp. at 4200 r.p.m. with a compression ratio of 6.5.

As regards wheelbases, that of the Six is 113 in., that of both the Super Six and the Eight, 118 in., while the Country Club sedans have a wheelbase of 125 in. The Six is available as a three-passenger coupe, a two-door, and a four-door sedan. The coupe and the two-door sedan may be equipped as utility cars at the option of the purchaser.

Front ends have been restyled, as may be seen from the photographs, and are uniform throughout all lines. Where running boards are not desired, a chrome strip is applied that matches with the body molding, and decorative rubber stone guards are secured to the rear fenders. The hood now includes the catwalks and extends all the way to the fenders, so that when it is lifted it makes the engine quite accessible. All front grilles are die-cast and chromium-plated, and extend the full width of the catwalk section.

All models have the new "sealed-beam" headlamps, which are mounted flush in the front fenders with ornamental chrome settings, while parking lights are contained in chrome-belt moldings at the side of the hood. These parking lights also serve as direction signals, and when the switch at the steering wheel is turned, the parking light on the turning side, together with a tail-light flasher, flashes on and off, thus giving a warning to traffic on intersecting roads as well as to that in the rear. Parking lamp direction signals are standard equipment on the Country Club models, optional at extra cost on other models. Twin horns are standard equipment on all except the low-priced Hudson Six.

The independent front-suspension system is of the type in which the steering head is carried between up-

Announces for 1940

Independent front suspension, with "center-point steering" on all models

per and lower, angularly-set wishbone-type links, with a coil spring interposed between the lower link and a frame bracket. The upper link is a steel forging, while the lower is built up of channel-section pressings of heavy material, and the coil springs are made of silico-manganese steel. Low-pressure double-acting hydraulic shock absorbers are mounted axially within the springs. The front suspension system also includes an equalizer bar.

In connection with the new front suspension, use is made of what is called center-point steering. This refers to the fact that the links connecting to the knuckle arms are pivotally connected to a steering arm near the center of the chassis. The drag link is of heavier construction than in previous models.

The steering gear is mounted on the inside of the frame side rail. Its roller-tooth construction has been made more rigid. The steering ratio is 18.2 on the Sixes and 18.4 on the Eights. Changes in the steering gear, drag link and steering arms combine to give perceptibly-faster stering than in previous models.

Rear springs now are 60 in. long, or 8 in. longer than previously. At their forward ends these springs have a rubber-bushed connection with the frame, while at their rear ends there are self-adjusting shackles provided with rubber seals. There is a lateral stabilizer also at the rear end, which has rubber mountings on the frame and rubber-cushioned connections to the axle.

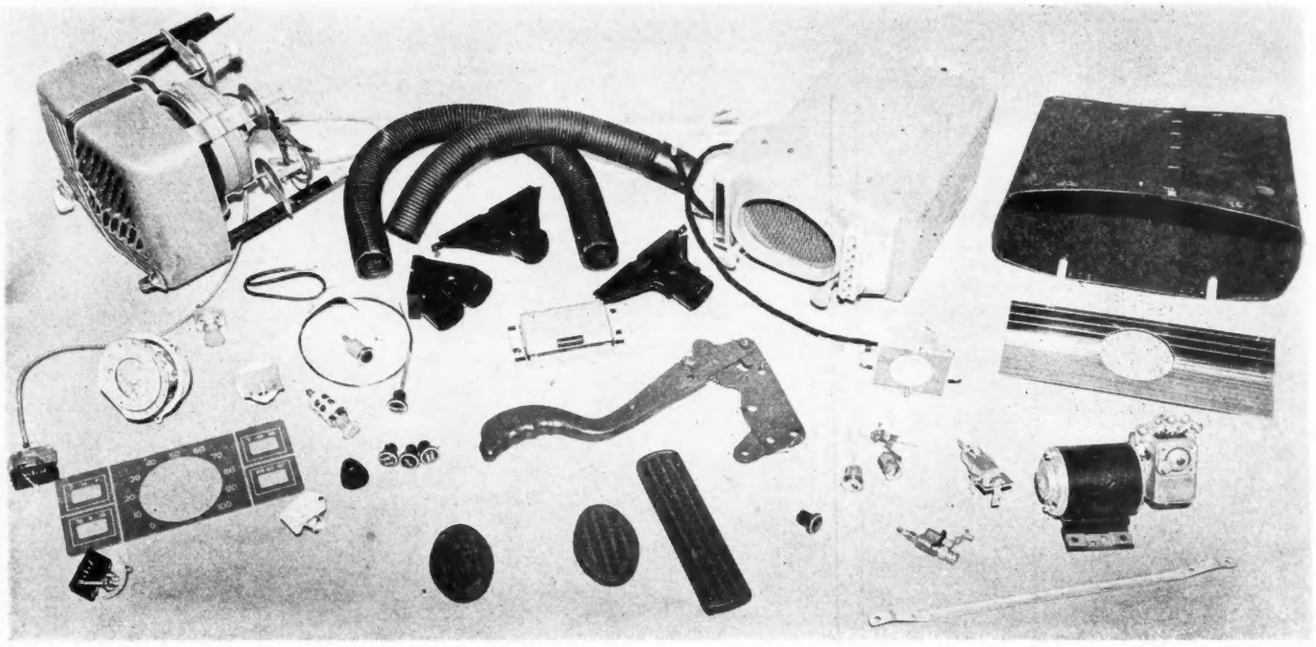
The Six DeLuxe is upholstered in a brown taupe stripe broadcloth, tailored in panel design, with buttons. Both front and rear seats are roll-topped, and

(*Turn to page* 225, *please*)

Hudson's improved dash-lock safety hood has its hinges at the front so wind cannot blow it open and locked at the dash so that when the car is locked the hood is locked against theft.

In the new Country Club models Hudson designers have used massive deep-formed seats, a new design of Airfoam cushioning and an entirely new Hockanum woolen upholstery material to achieve this effect.

Hudson introduces front wheel suspension with center point steering which has been further improved by the incorporation of Hudson's patented Auto-Poise Control. This development carries through the entire Hudson line.



Cleaning Up the Rat's

By Herbert Chase, M.E.

The instrument panel of the current cars conceals more mechanical intrigue than the ubiquitous screen in an Eighteenth Century comedy of manners. Some of the dramatis personae are suggested in the photograph above. A new plot is outlined in the article below.

Much has been done in the past few seasons to clear parts of the front compartment of modern motor cars, but, at the same time, congestion under the cowl has increased. As a result, there is often a decided lack of footroom. Some controls are hard to find or to reach. Radio performance is impaired by crowding the unit, including the speaker, into too small a space. Heaters are in the way of feet and do not distribute warm air uniformly through the car interior. Fittings for supplying fresh air to heaters are cumbersome. Defroster piping adds to congestion. Finally, and by no means least, servicing becomes difficult because of inaccessible and crowded units and connections.

No cure-all for this condition is suggested here. The problem has many angles and they vary on different cars and on various models of the same car. But conditions can be improved by relieving congestion and congestion can be decreased by relocation of some units. Some remote controls, involving flexible shafts, push-pull wires, linkages, or electrical types, may be required, but they are simple, inexpensive and easy to install and require no servicing.

Not all cars are equipped with radios and heaters, but these two units are the bulkiest of the items involved in this discussion and provision for them must be made on all cars, hence they tend to increase congestion even when not supplied as original equipment or subsequently fitted. One, or preferably both of these units should be located elsewhere than under the cowl, partly to ease congestion and partly to improve their performance. One logical location, and perhaps the best on most models is under the front seat. Adequate room exists there on some cars and can be gained by certain changes in others. One maker demonstrated this, as far as the heater is concerned, on 1939 models.

To locate a radio under the front seat should not be difficult. Large batteries (now generally under the hood) were placed under seats heretofore, and about the same space is required for a radio set. A speaker larger than that in common use might be located under the seat also, or in the back rest of cars with front and rear seats. Other locations for the speaker, as in head linings, for example, might yield better results in sound distribution, but if economy in cost of the radio as a whole dictates a single unit, there would be room enough in the under-seat alternative.

With a heater under the seat and a simple damper system, good distribution of heat in both or either compartment can be provided readily. Controls may still be on the instrument panel, if preferred, or adjacent to the heater, if that is desired. Provision for drawing in fresh air is readily made and with less cumbersome fittings than are required in some existing under-cowl layouts. Presumably, with an under-seat location, it should be possible to use the heater as a cooler in summer, converting it into a refrigerating unit (with

appropriate under-hood equipment) as is contemplated in air conditioning systems for both summer and winter use, now being prepared for production. If a good refrigerating job is to be done, the addition of an evaporator under the cowl, plus various control gadgets, is likely to add to present congestion in this area. This is an added reason for suggesting the location of the heater-cooler element, including a fan for moving air through it, under the seat.

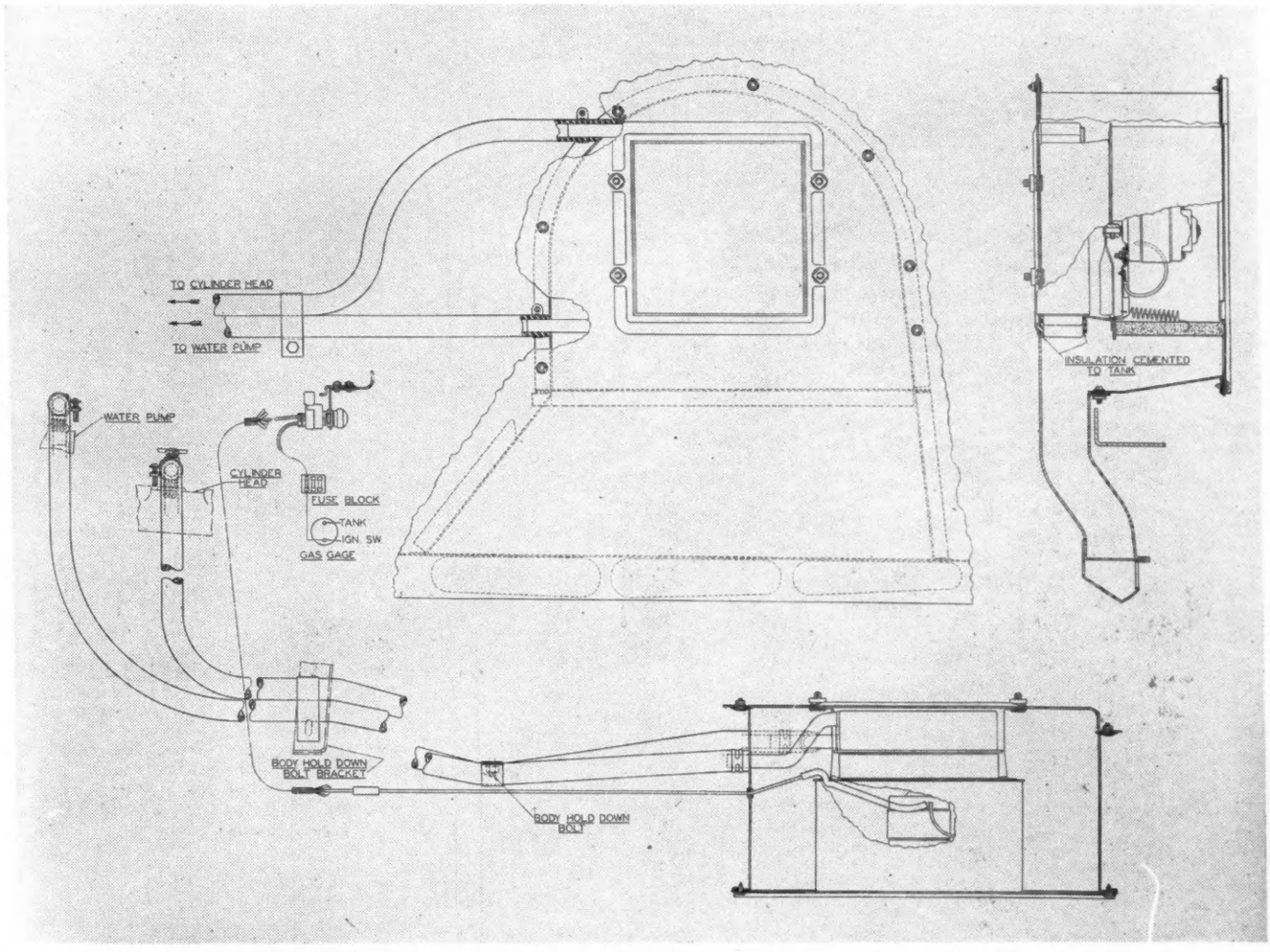
For those averse to under-seat locations of either radio or heater, there are other alternatives beside the current under-cowl positions. On some cars, either the heater or the radio or possibly both could be placed under the foot boards. This doubtless would necessitate some ducts below floor level, in the case of a heater, but this is not an impossible arrangement if due study be given the matter in designing the floor of the car. Batteries under the floor of the front compartment are certainly not unknown, and either a heater or a radio set can go in the same space, although the radio would then, presumably, have the speaker elsewhere. In fact, if the speaker and radio be separated the radio set can be placed almost anywhere that space exists, for the feasibility of flexible shaft remote controls even 15 ft. long has been demonstrated in many taxi installations. Granting this, a location in a rear baggage compartment, for example, is a possibility. There is, on many cars, some space seldom used close under the rear deck and next to the rear seat backrest.

With radio and heater stowed elsewhere, there is more room back of the instrument panel for instruments and control units. On some cars, the hand brake lever could be placed where more easily reached, as might be also the handle for operating the cowl ventilator and controls for trip odometer setting, clock setting and the like. Larger glove compartments may also be provided, if wanted. With congestion relieved under the cowl, servicing of parts there would be simplified, especially if certain parts of the instrument panel were hinged or made readily detachable.

If a heater be placed under the seat, defrosting might be thought something of a problem, but this was

(*Turn to page* 224, *please*)

Nest Under the Cowl



Layout of heater installation on the 1939 Studebaker under seat, relieving under-cowl congestion and giving better heat distribution.

CONTROL LAYOUT

MEN and MACHINES . . .

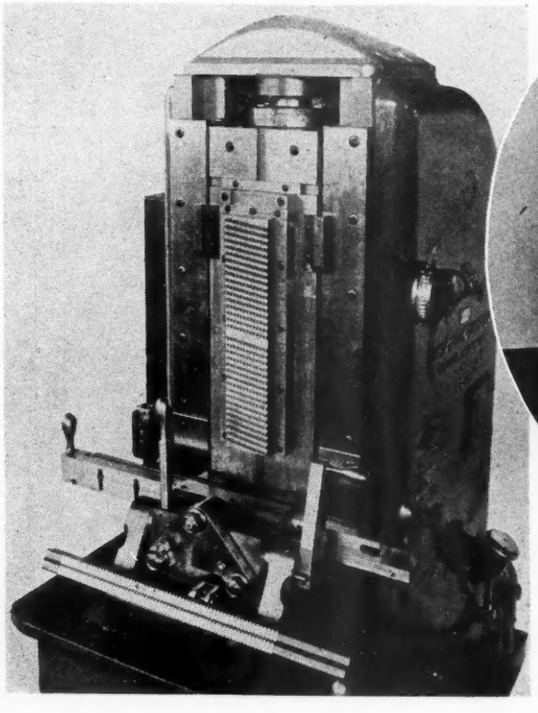
R. S. Elberty says that there are no "can't be tools as W. E. Happel points out the key to

INTERESTING comparisons of electric drives with hydraulic and mechanical drives for machine tools and some ideas on how to reduce the cost of the former have been advanced by W. E. Happel and R. S. Elberty, both electrical engineers associated with the Landis Tool Co.

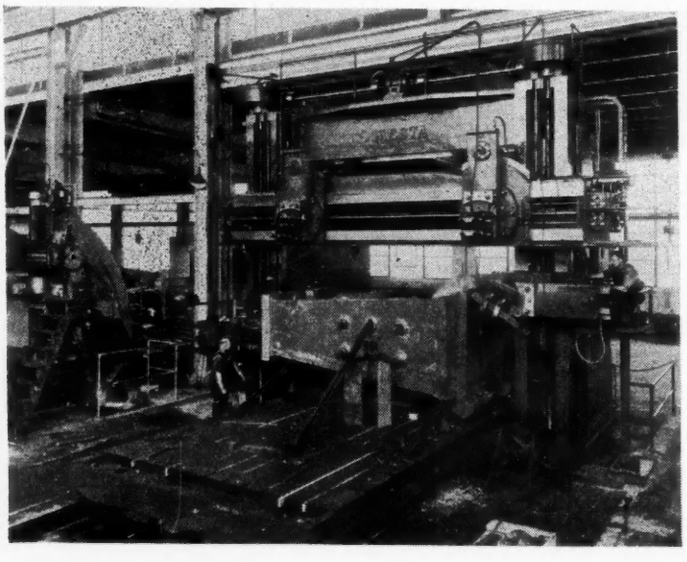
One of the most commonly used machine drives is the rotating, reversing drive and an analysis of a ¾-hp. application is reported to show that the cost of electrical or mechanical types are about equal. Also widely used on machine tools is the multi-speed rotating drive. Some simple forms of the speed change drives are: D.C. adjustable speed motor and control, A.C. four-speed motor and control, step pulleys and belt shifting means, and a gear shifting mechanism. According to Mr. Elberty, a cost study of these typical drives rated ¾ hp. constant torque showed that electrical speed change drives cost from 30 to 100 per cent more than the mechanical speed change drives.

Other types of drives are the reversing and multi-speed drive and the hydraulic rotating drive. The reversing and multi-speed drive can be combined with a rack and pinion to form a reciprocating straight line drive, and also can be obtained with a hydraulic pump, piston, cylinder, and reverse valve. Mr. Elberty states that a comparison of ¾ hp. short reciprocating drives shows that electrical drives exceed the mechanical and hydraulic drives as used on "Landis" grinders by from 40 to 80 per cent in cost. He adds:

"Hydraulic rotating drives have been used to obtain adjustable speeds and D.C. motor drives, either field control or variable voltage control, compare with this type of drive. Where a source of D.C. power is available, we will not question that the D.C. adjustable field motor drive is preferable from a cost standpoint. If a motor generator set must be furnished, the variable voltage drive costs but little more and furnishes wider speed control. A comparison of a 5-hp. constant torque hydraulic rotating drive with the equivalent variable voltage drive shows that the hydraulic drive costs



(Above) Three-way hydraulic broaching machine furnished recently by the American Broach & Machine Co. to a manufacturer of automotive jacks for broaching the ratchet teeth on the bars of bumper type jacks.

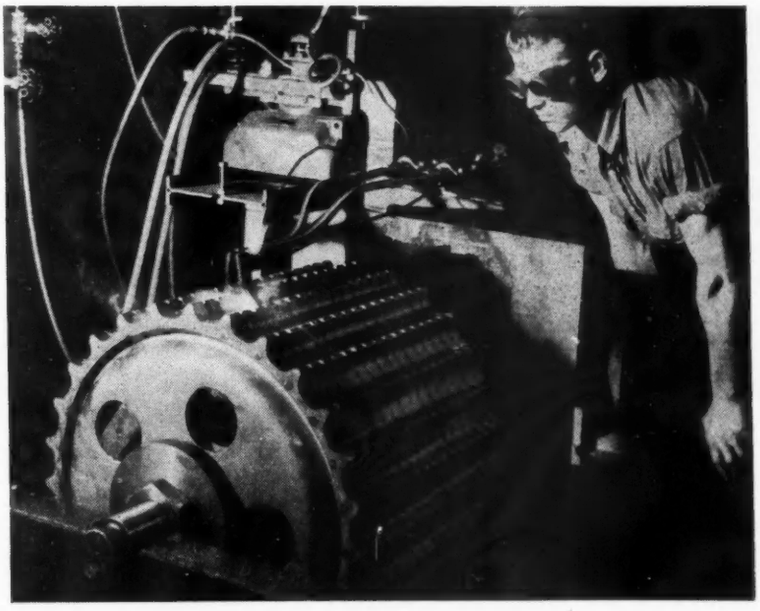


(Left) Probably the largest planer in the United States. A product of the Erie Foundry Co., the machine was designed to facilitate the machining of larger parts in the building of steam hammers.

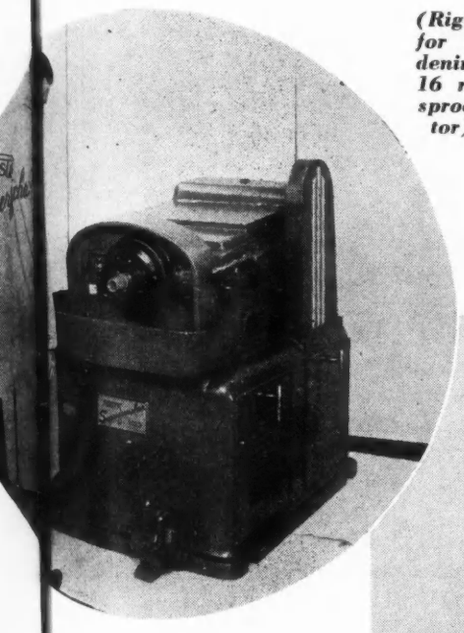
done" applications for electric drives on machine substantial cost reductions as "simplification"

about 10 per cent more than the electric drive."

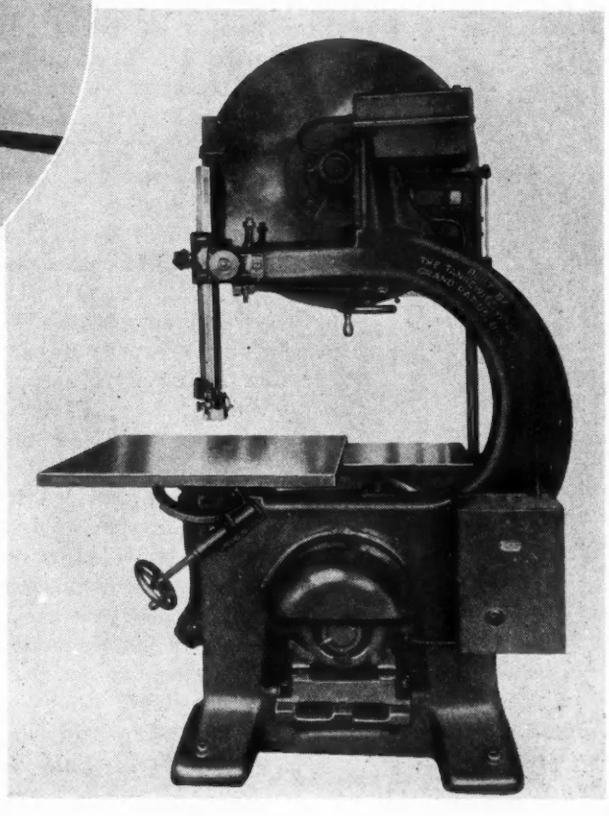
In concluding his comparison of cost differences between electric, hydraulic, and mechanical drives, Mr. Elberty stressed the versatility of the electric type and said that there are no "can't be done" applications for electric drives on machine tools. Inasmuch as costs of mechanical and hydraulic devices are continually being reduced, Mr. Elberty emphasized that further reductions in costs of certain electrical equipment are necessary if electric drives are to attain their fullest possibilities on machine tools.



(Right) Set-up for flame hardening teeth of 16 rear drive sprockets (tractor) at a time.



(Circle) Semi-horizontal brake drum Superfinishing machine built by the Foster Machine Co.



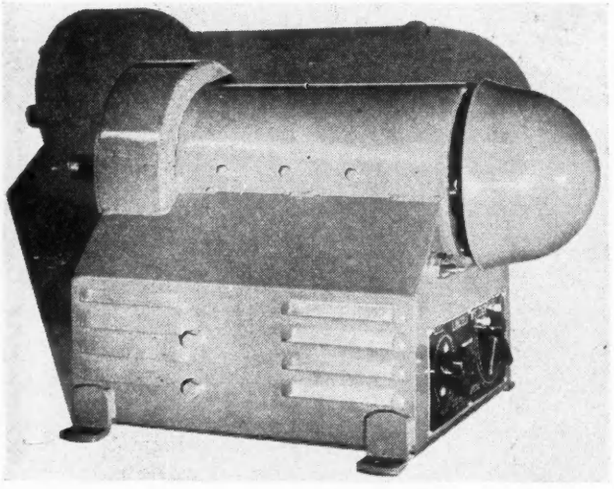
(Right) A 36-in. high-speed sheet metal cutting band saw which is a recent development of the Tannewitz Works.

With regard to the problem of reducing costs of electric drives, Mr. Happel holds to the view that if a machine tool builder's electrification costs are high it is usually because of conditions created by his specifications and design. He, too, confirming W. F. Ridgway of the Ingersoll Milling Machine Co., whose comments were contained in the preceding installment of *Men and Machines*, names "simplification" as the key to substantial cost reductions.

One typical case which Mr. Happel cites to back up his argument is the following: "A cost analysis was made recent-

ly as a preliminary step in a proposed redesign project covering a rather complicated semi-automatic machine. The analysis disclosed that the electrical equipment constituted a substantial part of the overall cost, appearing too high when compared with similar mechanical and hydraulic mechanisms on other machines. A redesign embodying increased hydraulic applications seemed in order. However, before returning the machine to the design section, the electrical engineers investigated each application for possible reductions in cost. As a result, a new control scheme was evolved, employing fewer control relays and eliminating one complete A.C. motor plugging control. Wiring was simplified. The final reduction in cost of the electrical equipment was $134 per machine. Mechanical equipment to the amount of $50 also was eliminated. In addition to the saving, the machine is now easier to set up and adjust. The efficiency, versatility and value of the machine from the user's standpoint were increased."

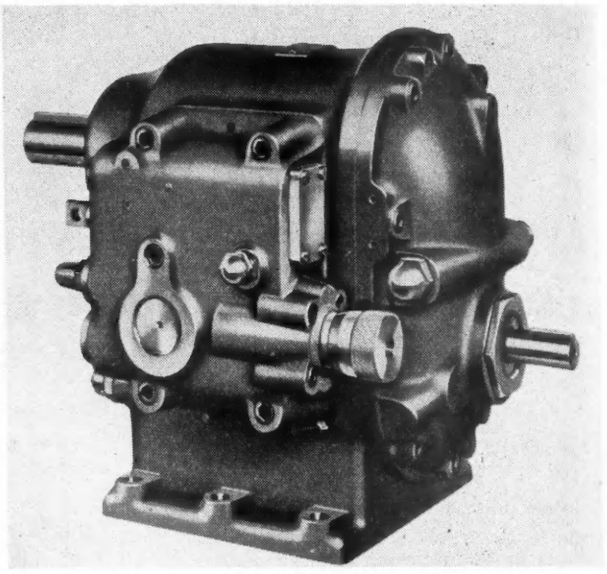
Further opportunities for cost reduction will be found in careful attention to the electrical accessories. While some companies standardize on certain limit switches, control stations, timers, brakes, etc., Mr. Happel says that his company has found it desirable to avoid this practice. The reasons given for avoiding standardization are as follows: "1. The electrical and mechanical characteristics of accessories vary widely as do also their prices; 2. Auxiliary equipment should



Lincoln Electric Co.'s new small arc welder rated at 20 amp.

be applied in the light of the duty imposed, which is a variable factor; and 3. The possibilities for freedom in design are greatly increased when no rigid standardization rules apply."

The final paragraph of Mr. Happel's paper is one that many individuals engaged in the production of machine tools would find profitable to paste in their hats. Here it is: "Electrical equipment should be designed into not onto the machine. Application must begin on the drawing board. Selection of equipment and a scheme of control should be a function of the engineers. They are best qualified because, first, they have an intimate knowledge of the conditions surrounding each application, and secondly, they can coordinate the design mechanically and electrically to keep within a practical electrification budget."



Two hp. oil power variable speed transmission built by the Sundstrand Machine Tool Co.

* * *

With the opening of the machine tool shows in Cleveland only a month distant there has been a substantial increase in the number of new equipment announcements submitted to this department. While quite a few of these cannot be discussed until Oct. 1, date of the annual Achievement Issue of AUTOMOTIVE INDUSTRIES, we still have plenty to report. For instance there is the Erie Foundry Co.'s newest planer, probably the largest in the United States, which was designed to facilitate the machining of larger parts in the building of the large size steam hammers. It is of the conventional double-housing type, 16 ft. 6 in. between the housings by 14 ft. 3 in. from the table to the underside of the rail. The table length is 35 ft. 10 in. Total weight of the planer is nearly 900,000 lb. Drive and speed control are the largest of the type that have ever been built. The main motor drives the table through worm and spur gear reductions. It has a nominal rating of 75 hp. and under some speed and torque conditions it will deliver twice this power. A speed range of 3.2 ft. per min. to 96 ft. per min. is available in both cut and return directions. Individual electric feeds are provided for each head, with feed range per stroke from 1/64 in. to 1½ in. Pneumatic tool lifters are provided on each head.

Several different manufacturers of automobiles recently adopted the new semi-horizontal brake drum superfinishing machines built by the Foster Machine Co. On this machine the drum to be superfinished is located on an adapter that is fitted to the hub of the drum. The drum is held on the adapter by an air-

(*Turn to page* 228, *please*)

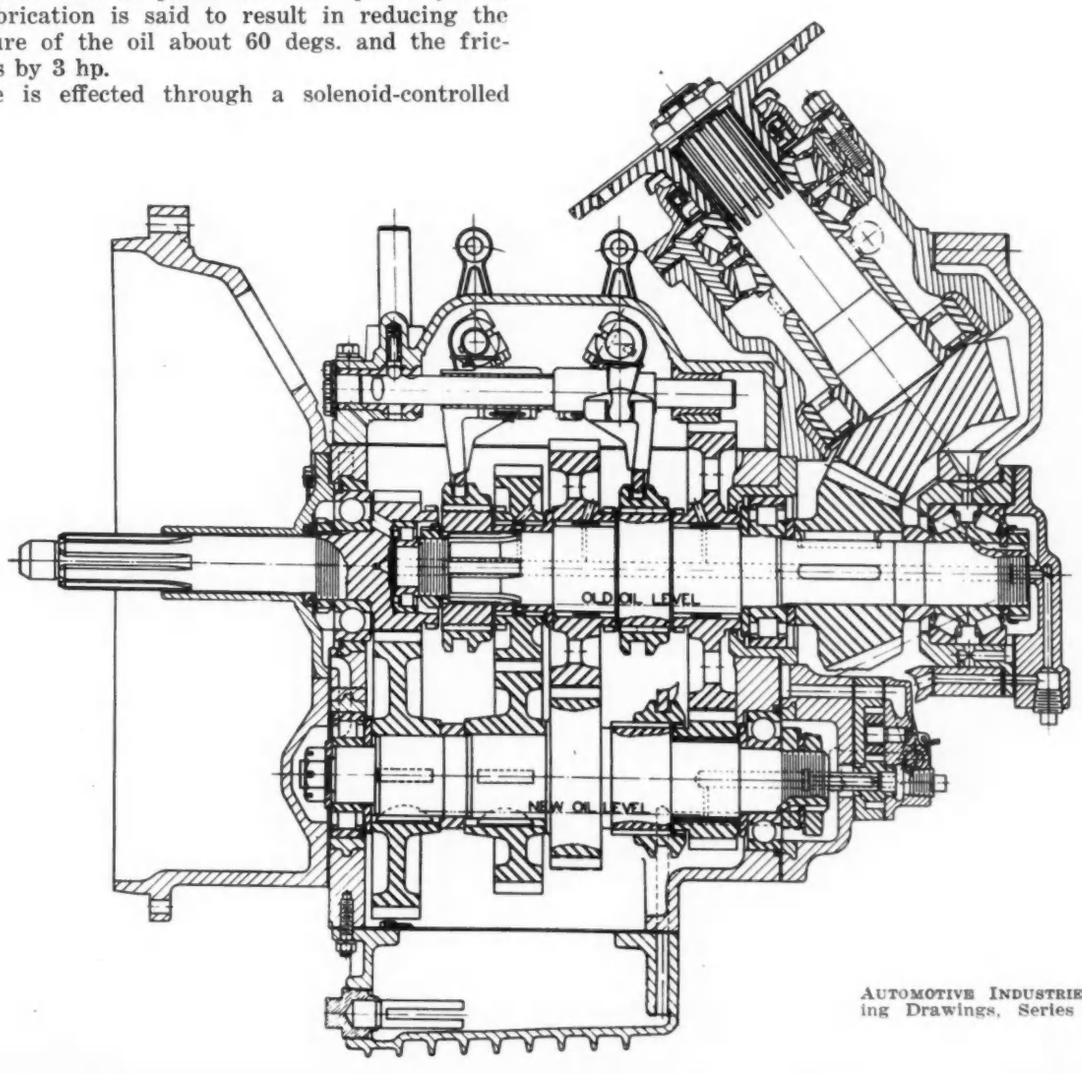
YELLOW COACH FOUR-SPEED TRANSMISSION

Longitudinal-Vertical Section

The drawing reproduced herewith is a longitudinal vertical section of a four-speed constant-mesh transmission which General Motors Truck and Coach Division installs on urban and interrurban buses equipped with its largest gasoline and Diesel engines. It has a torque capacity of 550 lb.ft. All gears except those of the reverse train are of the helical type and remain in mesh continuously. A special feature of this transmission is the oiling system, lubrication being by pressure pump instead of by the conventional splash system. The gear-type pump which puts the oil under pressure is driven from the countershaft. Oil is delivered to the drilled main shaft through cored holes in the housing, and returns to the sump by gravity. Pressure feed permits of the use of a low oil level, which reduces churning losses and heating of the oil. Before it enters the pump, the oil passes through a large strainer. As compared with the splash system, forced lubrication is said to result in reducing the temperature of the oil about 60 degs. and the frictional loss by 3 hp.

Reverse is effected through a solenoid-controlled shift fork, by means of a control button on the driver's shift lever. At the rear of the transmission there is a pair of spiral bevel gears, with the pinion keyed to the transmission tailshaft, through which the power is transmitted to an angular propeller shaft.

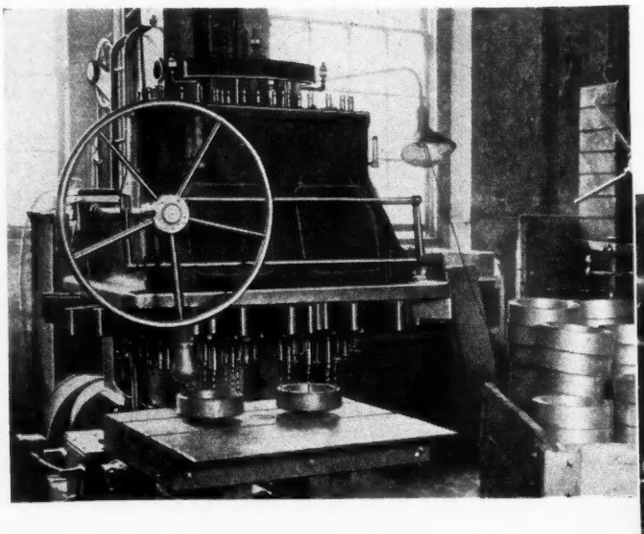
All large-capacity interurban Yellow Coach buses, including some operated by Greyhound, are equipped with this transmission. A survey of field results obtained, made last year, covering 520 transmissions which had accumulated a total of 67,170,916 miles, showed that the pressure lubricating system reduces the operating temperature and that the exclusion of dirt, carbon and other foreign matter from the bearings by the oil strainer has a very beneficial effect on the life of all wearing parts.



AUTOMOTIVE INDUSTRIES Engineering Drawings, Series III, No. 9.

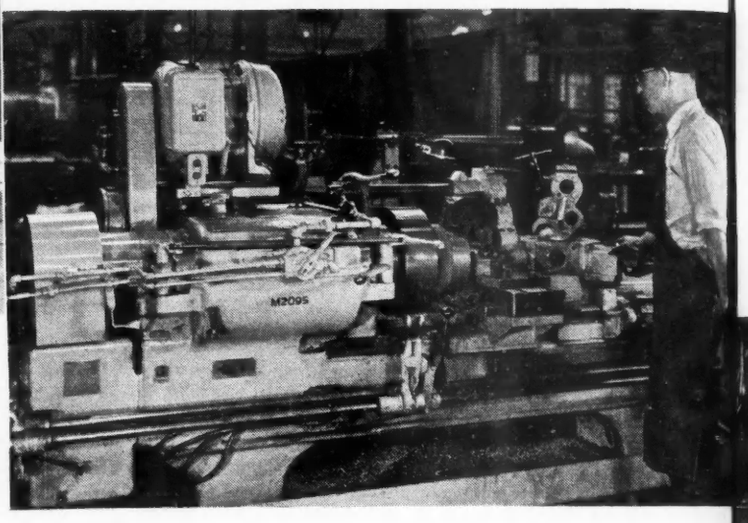
Flywheel Production Practices

(*Continued from page* 199)



(Left) View of multiple-spindle Natco at Minneapolis-Moline, drilling 8 holes in each of two flywheels as shown

(Below) No. 2F Foster Fastermatic turret lathe turning small flywheel for starting engines at Caterpillar



to a 0.002 in. limit using an Ex-Cell-O precision boring spindle mounted on the machine column in place of the conventional slide.

After turning the wheel over and locating from this pilot hole, the crank face is finished and six clutch cover holes and six crank bolt holes are drilled in the last Bullard operation.

The next operation is to ream two of the crank bolt holes to be used to locate the crank and flywheel assembly while the other four holes are reamed in assembly; and to step-ream six clutch cover mounting holes which must be concentric with the pilot hole and crank bolt holes and within 0.002 in. limit across the bolt circle.

Balancing is done on a General Motors balancing and drilling machine, assemblies being balanced to ¼ oz.-in.

Caterpillar

This company makes 33 flywheels ranging from an 8½-in. diam. wheel for the two-cylinder starting engine to the 24-in. diam. wheel for the big V-8. Weight ranges from 28 lb. for the little job to 425 lb. for the big one. In addition to these basic sizes, Caterpillar is prepared to machine countless special wheels according to the specifications of its engine customers.

By far the greater part of the larger flywheels are turned either on a pair of No. 6RE Potter & Johnston's or a pair of No. 7D Potter & Johnston's, while the smaller flywheels are turned on a pair of Foster Fastermatics. These turning machines are supplemented by 42 in. Bullards, which take care of those flywheels too large for the No. 7D Potter & Johnston's, and special flywheels which it is not practical to tool

International Harvester Factory Flywheel Routing

OPERATION	EQUIPMENT
Rough turn and chamfer ring gear diameter, turn ring gear stop shoulder on outside diameter, rough and semi-finish face crankshaft side. Rough bore crankshaft flange register and clutch shaft pilot bearing bore	Gisholt Simplimatic lathe
Rough face clutch side; rough turn outside diameter on clutch side, bore and form oil slinger	Gisholt simplimatic lathes
Finish bore crankshaft flange register. Finish bore and chamfer clutch shaft pilot bearing bore. Finish face crankshaft side and semi-finish turn ring gear diameter	Gisholt simplimatic lathe
Drill 6 clutch mounting cap screw holes, 4 flywheel to crankshaft bolt holes and 2 dowel holes	Model "A" type 13 Natco multiple drill
Hand-ream crankshaft register and clutch shaft pilot bearing diameters	Bench with fixture and step reamer
Finish face clutch face, finish turn and finish chamfer ring gear diameter, ring gear stop diameter and outside diameter at clutch side	Gisholt simplimatic lathe
Tap 6 clutch mounting cap screw holes	No. 2-X Garvin tapper
Drill 3 oil holes in oil slinger and counterbore 6 clutch mounting cap screw holes	2-spindle Type PF Allen drill
Surface grind clutch face	No. 22 Heald rotary surface grinder
Press and shrink ring gear on flywheel	No. 1123 Junior thrift gas oven Hannifin air press
Hand ream crankshaft register and clutch shaft pilot bearing diameters	Bench
Blow out tapped holes, balance, and stamp light side Inspect	18 in. Gisholt 12-E static balancer

up for the Potter & Johnston's. The remaining equipment is more flexible, consisting of radial drills, multiple drills, gear shapers, etc., over which any of the pieces may be run.

All flywheels are balanced on Gisholt static balancing machines within 0.2 oz.-in.

Chrysler

Typical of mass production, this organization produces only two flywheels—one for the "6," the other for the "8." Both wheels are of the same diameter but of different width, the wheel for the "8" being the heavier. Ring gears also vary in size, a heavier ring being used on the "8," in each case the ring being shrunk-on by expanding in an induction heating machine.

Flywheels are balanced after assembly on the crankshaft, total balance being held within 0.5 oz.-in. Important new practice unique with Chrysler is the superfinishing of the clutch contact face.

Cummins Engine Co.

Producing a wide variety of automotive and industrial Diesel engines, this company machines a total of approximately 250 different flywheels varying both in size and detail. Sizes range from 15 in. to 36 in. in diam., and from 1½ to 7 in. in major thickness.

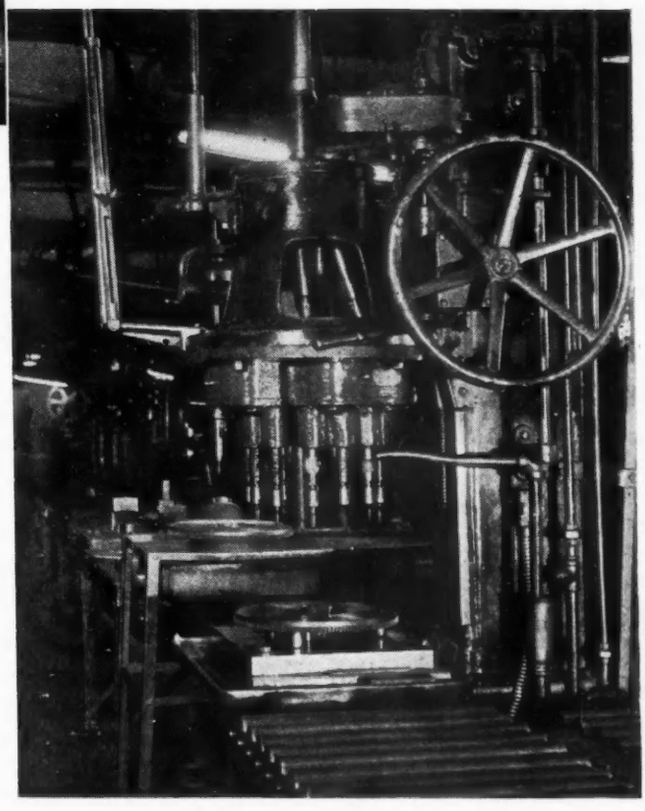
It is obvious that the machine shop set-up has to

(Lower Right)Tapping six holes in Packard flywheel is done on this Fox 6-spindle tapper

(Below) Close-up of 12-in., 8-station, Bullard Mult-Au-Matic, one of a battery in the flywheel machine line at Buick. This is the second operation set-up, after the ring gear assembly.

Waukesha Factory Flywheel (Low Production) Routing

OPERATION	EQUIPMENT
Rough and finish turn, bore, counterbore, and face motor side and turn ring gear fit	Bullard vertical turret lathe
Rough and finish turn, bore and face clutch side complete	Bullard vertical turret lathe
Drill and ream crankshaft flange holes	Barnes Drill Company multi-drill and Waukesha special head
Drill and chamfer clutch holes	Barnes Drill Company drill and Waukesha special head
Tap clutch holes	Avey Hi-speed tapper
Mark timing and stamp part number	Bench and Universal marking fixture
Balance and drill holes for correction	Gisholt dynamic balancer and Rockford drill
Inspect	
Shrink on ring gear and set to shoulder	Calorac electric induction heater
Blow off, wipe both sides and load on skid	

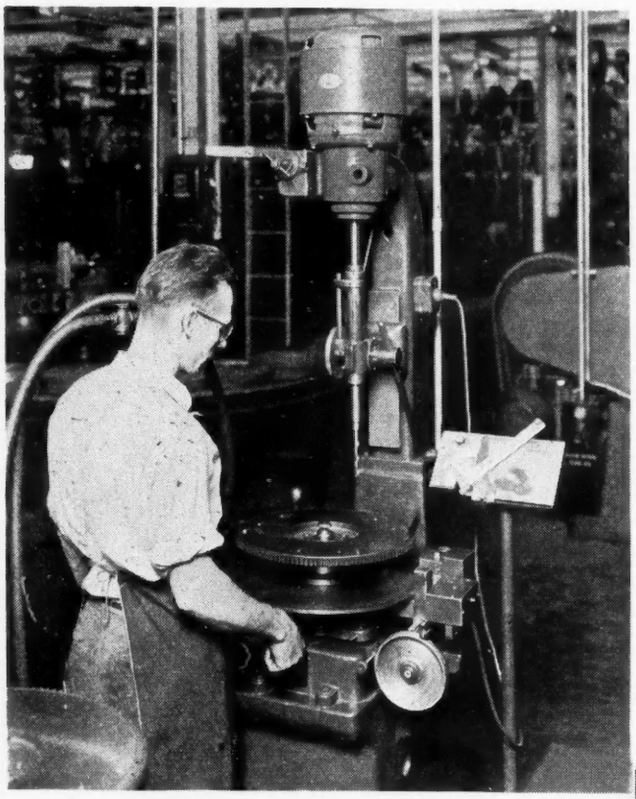


Waukesha Factory Flywheel (High Production) Routing

OPERATION	EQUIPMENT
Rough and finish bore, counterbore turn and face clutch side. Rough and finish turn, bore and face and turn ring gear fit	Gisholt simplimatic lathes
Ream pilot hole	Cincinnati drill
Drill and ream crankshaft flange holes	Barnes Drill Company multi drill and Waukesha special head
Drill and chamfer clutch holes	Barnes Drill Company and Waukesha special head
Tap clutch holes	Hi-Speed Avey drill and Waukesha special head
Mark timing and stamp part number	Bench and Universal marking fixture
Balance and drill holes for correction	Gisholt static balancer and drill
Inspect	
Shrink on ring gear and set to shoulder	Calorac electric induction heater
Blow off, wipe both sides and load on skid	

Cadillac Factory Model 39-50 Flywheel Routing

OPERATION	EQUIPMENT
Inspect rough casting	
Rough turn, outside diameter and rough face, bore oil slinger diameter, and 14 in. diameter. Rough the central bore, finish turn the outside diameter. Shave the face, chamfer and size the 14 in. diameter	Gisholt Simplimatic lathe
Turn ring gear diameter, rough and finish face, finish central bore, finish turn ring gear diameter	Gisholt Simplimatic lathe
Assemble starter gear to flywheel and test for tightness	Calorac ring expanding machine Logan air operated Arbor press
Finish face clutch plate face	Model A-10 Sundstrand lathe
Drill 12 holes	25-H Baker drill press
Drill and ream 2 dowel holes, drill oil slinger holes	24 in. Cincinnati drill press
Chamfer all holes and counterbore 6 holes	No. 2 Avey 3-spindle drill press
Tap 6 American thread holes	21 in. Cincinnati drill press
Wash	Tank
Balance (if necessary)	GM Balancing machine
Final inspection	Bench

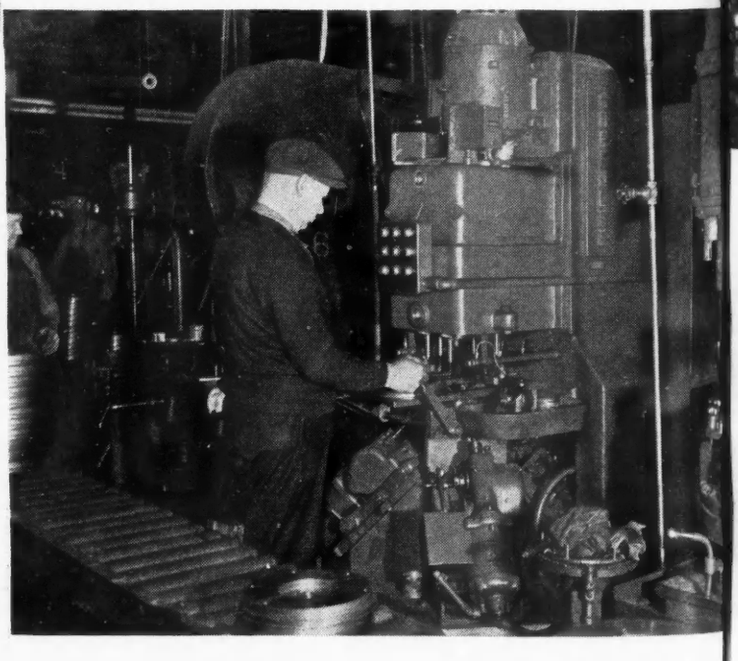


be extremely flexible particularly in view of the fact that ofttimes as many as 20 to 25 different wheels have to be produced during the course of a single week. The latest type of machine used for flywheel production in the plant is the No. 4A Warner & Swasey accommodating wheels up to 24 in. in diam. For larger wheels, they use a Bullard vertical lathe. Also available are a Gisholt turret lathe and a McDougal engine lathe with variable speed transmission which is used for small volume production of service wheels. All standard drilling is done on a new American "Hole-Wizard" Radial. Wheels requiring special drilling or milling are handled on a Lucas horizontal precision mill using a dividing head.

Flywheels are finished all over, the center bore being held to 0.0005 in. on the diam. and total indicator

(Left) 18-in. Gisholt model 12E static balancer is used for flywheel balancing in the International Harvester engine plant

(Below) Unique Greenlee machine at Studebaker combines vertical drill head with inclined angular head, under the table, for drilling angular oil holes and tapping clutch screw holes in flywheel



Hercules Factory Flywheel Routing

OPERATION	EQUIPMENT
Machine engine side. Finish machine countershaft pilot	20 in. Gisholt automatic lathe
Machine and burnish clutch side. Rough bore, finish and ream holes	20 in. Gisholt automatic lathe
Drill and countersink bolt holes. Drill and ream dowel holes	Aurora 24 in. drill with 8 spindle cluster
Drill 6 clutch holes	Allen single spindle sensitive drill
Drill 3 drain holes	Allen single spindle sensitive drill
Countersink clutch holes. Tap puller holes	Leland - Gifford sensitive tapping machine with head
Ream 6 clutch holes	Allen single spindle sensitive drill
Hand ream countershaft pilot	Floor
Assemble ring gear	Special Hercules electric heating machine
Balance	Gisholt static balancer

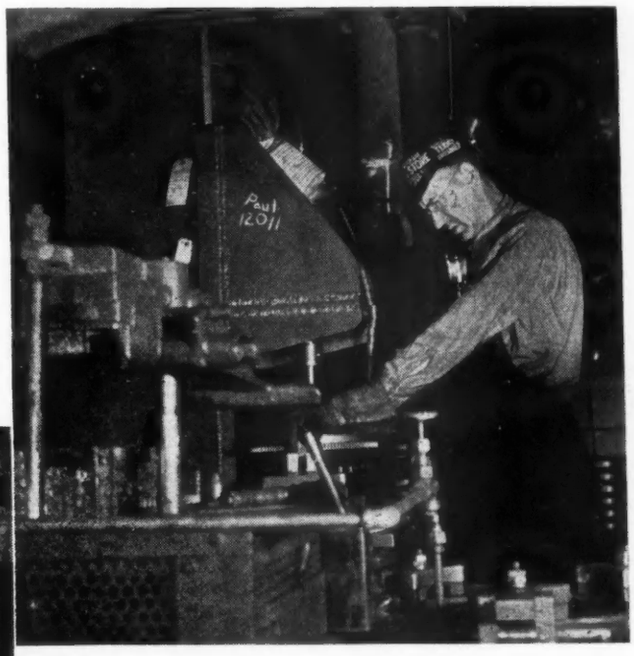
reading on run out of 0.002 in. The starter gear diameter is held to 0.003 in. The gear is heated with a gas flame and shrunk on. Clutch face and bores are finished with carbide tipped tools at 300-350 f.p.m. with feed of 0.005-0.011 in., and a tolerance of 0.002-0.004 in. on the diam., and 0.003 in. indicator reading on the run-out face. All production tools are either of Stellite 2400 or carbide tipped.

All wheels are statically and dynamically balanced on "Hi-Eff" balancing machine. Balance is held within 1 oz.-in.

General Motors Truck

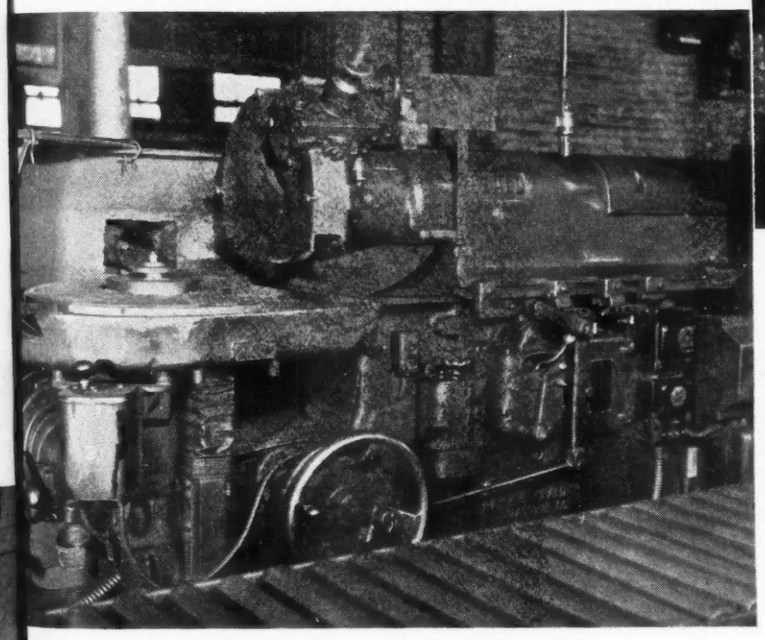
Excellent example of flexibility is found in this plant where a total of 45 flywheels of different designs are machines on a line comprising 16 standard machines. Since flywheels are machined in lots of 25 to 400 pieces, it is imperative to have complete flexibility of machines and tooling in the interest of rapid and economical changeover. Skillful tool design has been applied to develop a set-up in which the total time required to change the tooling from one wheel to another is about 17 hours.

The machines in this line are so arranged as to permit the operators to tend two or more machines at a time with a minimum of movement and backtracking. Progress of work from station to station is facilitated by the use of a gravity roller conveyor.



(Right) Ring gears at Studebaker are assembled with the aid of the Calorac induction heating expander, cutting assembly time to a matter of a few seconds

(Below) No. 25-A Heald rotary surface grinder is used for grinding and polishing clutch face on Packard flywheels



The flywheels range from 14¼ in. diam. to 18¼ in. in diam. and from 35 lb. to 83 lb. in finished weight. All finished surfaces of any importance are held within a run-out tolerance of 0.003 in., total indicator reading, with respect to the crankshaft register face and bore. All wheels are statically and dynamically balanced to ¾ oz.-in. on a special GMR balancing machine, fitted with an adjustable spindle drill for removing excess weight.

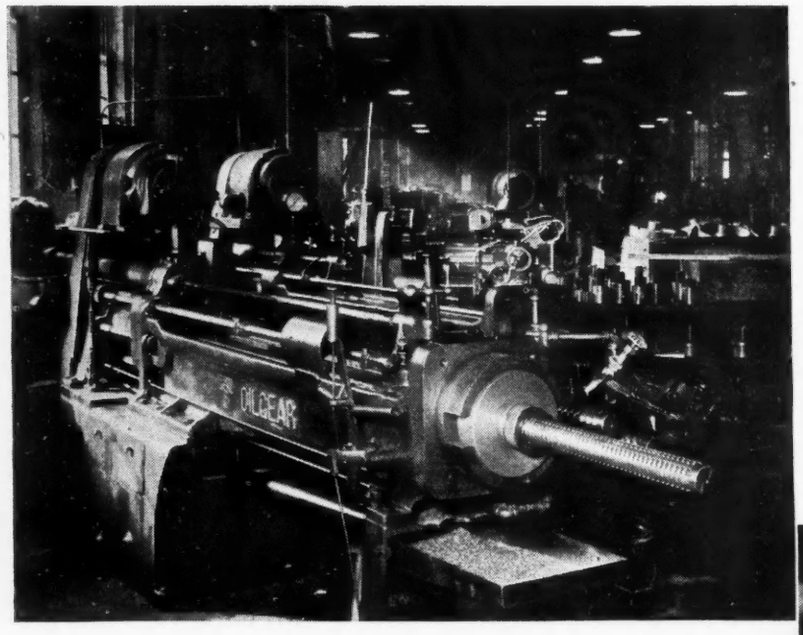
As mentioned above, the machines are of standard design and may be readily changed

Caterpillar Factory Flywheel Routing

OPERATION	EQUIPMENT
Chuck on ring gear diameter, turn outside diameter, turn face and rough bore hub, face web, bore diameter, face beveled surface, bore large undercut, bore gear diameter, face end and chamfer	No. 7D Potter & Johnston automatic lathe
Locate in gear diameter, bore and face crankshaft flange diameter, bore, counterbore, turn ring gear diameter and ream hub	No. 7D Potter & Johnston automatic lathe
Shape teeth	No. 612 special Fellows Spur gear shaper
Drill bolt holes	No. 30 Natco round head multiple drill 12-spindle
Ream and countersink flange holes and drill and tap 3 holes	OA 4 ft. Carlton light duty radial drill
Drill, ream and counterbore oil hole and drill and tap other oil hole	OA 4 ft. Carlton light duty radial drill
Wash and clean	Caterpillar type washer
Assemble plug, heat ring gear and shrink on flywheel, stamp timing marks	Electric furnace
Drill and tap 12 capscrew holes	Hammond radial drill
Assemble lock and capscrew	Floor
Balance	Gisholt static balancing machine

Packard Factory Flywheel Routing

OPERATION	EQUIPMENT
Rough and finish turn, face front, face bore and chamfer hole	Gisholt lathes
Rough and finish clutch side of counterbore to depth	Gisholt lathes
Inspect	
Assemble flywheel and flywheel ring gear by shrinking	Hannifin air press
Ream hole	Colburn drill press
Drill 18 holes and ream 6 holes	Baush multi spindle drill
Stamp timing and paint with white lacquer two places	
Drill 3 oil holes	Henry and Wright drill
Tap 6 threads	Fox 6-spindle tapper
Grind clutch face, polish clutch face, burr 6 holes. Blow out tapped holes	25-A Heald rotary surface grinder
Inspect	Bench



over to accommodate any type of wheel. On Gisholt machines, the tool blocks are so designed that the tool bits can be arranged in a variety of positions. In addition, the blocks can be readily relocated on tool slides. Mounting holes are drilled, reamed, or tapped on single spindle drill presses, fitted with adjustable spindle drill heads. Two standard 24 in. Bullard vertical turret lathes are used for the finish-facing of the clutch face and crankshaft register. Each of these machines is equipped with a single universal fixture so designed as to permit the application of any flywheel without removing the fixture from the machine.

Hercules Motors Corporation

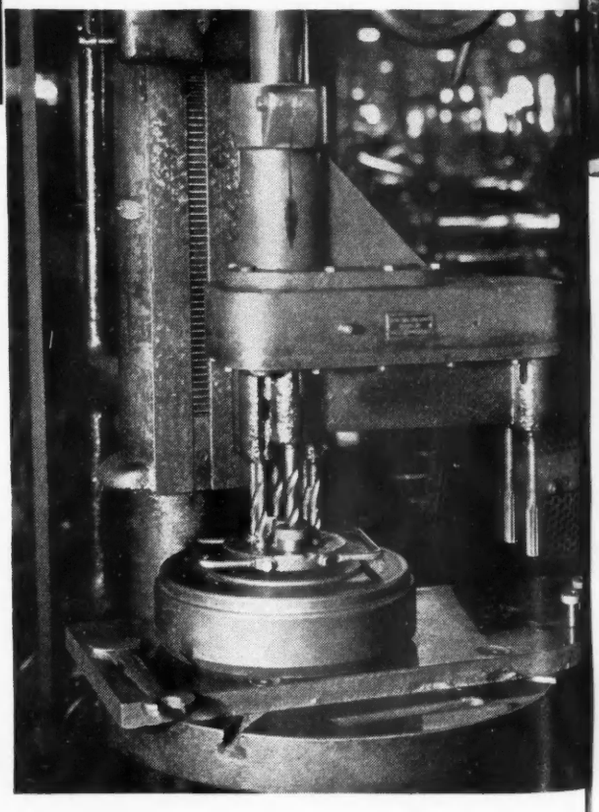
Some idea of the tremendous variety of flywheel variations required in commercial engine production may be gained from the fact that this company has a total of about 1500 flywheels for its line of 54 gasoline and Diesel engines. The variations include differences in diameter and thickness, differences in SAE clutch and coupling specifications. Here, again, flexibility of set-up is of paramount importance. For low volume requirements, the wheels are turned on Gisholt single spindle machines; for medium production they use Gisholt automatics; for high production, the wheels are turned on Gisholt Simplimatics.

The Hercules routing reproduced here is typical of medium production practice. All wheels are statically balanced on Gisholt equipment holding balance within 0.3 oz.-in.

Interesting feature of the Hercules flywheel machine line is the use of a special induction heating machine for expanding starter gears prior to shrinking onto the wheel. The heating device is essentially a transformer, 22 k.v.a. capacity, so designed that the ring gear, when slipped into a slot in the coil, becomes the short-circuited secondary. The current induced is low in voltage but high in amperage. It heats the ring up to 600-700 deg. Fahr. in 19 sec. The previous method, using an open flame, took more than 6 min. for each ring; moreover, the heat now is applied uniformly, there is no spoilage, and the temper is not taken out of the gear.

International Harvester

In current production this company handles four truck engine flywheels, three tractor wheels. Sizes range from 14 in. to 18 in. in diam.; and from 50

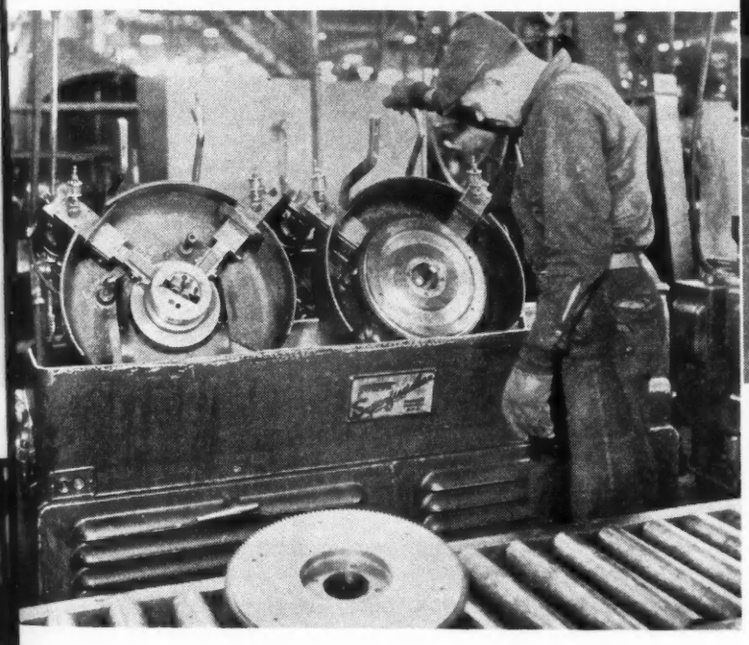


(Above) Oilgear horizontal broaching machine is used for broaching and stamping timing gear marking on Minneapolis - Moline flywheels

(Right) Aurora 24-in. drill with 8-spindle cluster on Hercules flywheel line is used for drilling and countersinking bolt holes, drilling and reaming dowel holes

Continental Factory Flywheel Routing

OPERATION	EQUIPMENT
Rough finish crankshaft side	Gisholt No. 3 Simplimatic lathe
Rough rear side	Gisholt No. 3 Simplimatic lathe
Finish rear side	Gisholt No. 3 Simplimatic lathe
Finish crankshaft side	Gisholt No. 3 Simplimatic lathe
Polish clutch face	24 in. vertical Bullard
Drill and ream bolt holes and drill and counterbore clutch screw holes	Natco multiple upright drill
Drill 3 angle oil holes	Leland-Gifford 14 in. single spindle speed drill
Tap clutch screw holes	No. 2 Garvin tapper
Wash	
Heat ring gear	Calorac electric ring expander
Shrink on ring gear	No. 3 Logan air press
Stamp timing	Special fixture
Balance	No. 9 Gisholt static balancer



to 225 lb. in weight, the latter for the big tractor engine. All of the machine equipment is extremely flexible, each individual machine being adaptable for any wheel within its capacity. Naturally the tooling is changed for each different wheel.

All wheels are balanced after the ring gear is pressed on and the clutch face finish-ground. For balancing, the company has three static balancing machines—an 18-in. Gisholt, a 24-in. Gisholt, and a 24-in. Micropoise balancer which combines the balancer and drilling attachment.

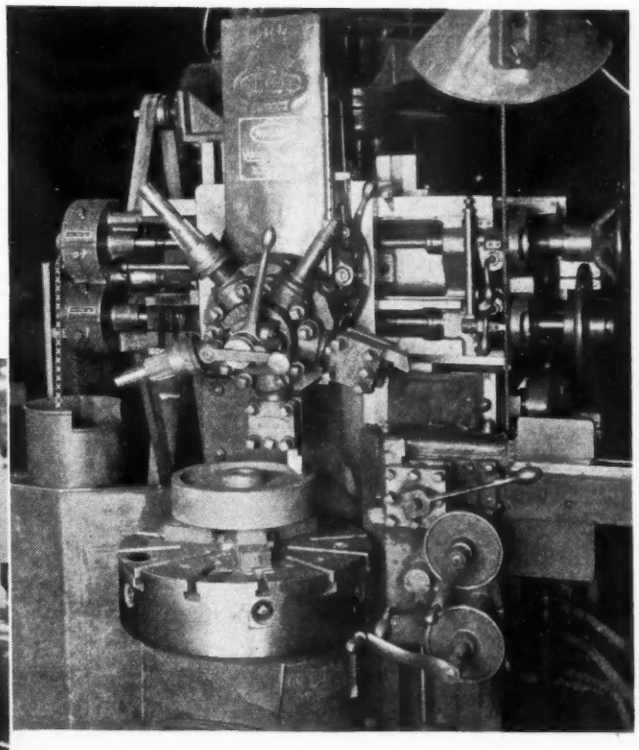
The small wheels are balanced within 0.3 oz.-in.; large wheels to 0.4 oz.-in.

Minneapolis-Moline

This company has six flywheels in current production for its tractor engines, ranging from 10½ in. to 17⅞ in. in diam. Flexibility is paramount in view

(Left) At Chrysler the flywheel clutch face is Superfinished on the machine shown here. The view at the left shows the finishing stones exposed

(Below) Bullard 24-in. vertical turret lathe used by Minneapolis-Moline for turning and boring flywheels



General Motors Truck Factory Flywheel Routing

OPERATION	EQUIPMENT
Chuck on ring gear diameter. Rough face clutch friction face, clutch cover face and rim. Rough turn diameter, form groove and rough bore clutch cover diameter	Gisholt Simplimatic lathe
Rough turn ring gear diameter, face rim and crankshaft seat and form relief	Gisholt Simplimatic lathe
Finish bore and chamfer pilot hole. Finish turn ring gear diameter, finish face rim	Gisholt Simplimatic lathe
Assembly ring gear	Hannifin air press Special gas furnace
Finish ream pilot hole	21 in. Aurora single spindle drill press
Finish turn diameter, form radius, semi-finish bore clutch cover diameter, form relief and face inside face	Gisholt Simplimatic lathe
Drill crankshaft and clutch holes	24 in. Cincinnati-Bickford single spindle drill press
Counterbore 6 crankshaft holes and countersink 9 holes	24 in. Cincinnati-Bickford single spindle drill press and electric drill
Tap 9 clutch holes and ream 6 crankshaft holes	24 in. Cincinnati-Bickford single spindle drill press
Finish face clutch friction face and clutch cover seat	24 in. Bullard vertical turret lathe
Finish face crankshaft register	24 in. Bullard vertical turret lathe
Stamp timing marks	Bench
Balance to ¾ ounce-inches.	General Motors Balancing machine

of the need for rapid changeover from one size to another. The use of the Bullard vertical lathe for turning, vertical multiple drill for the holes, and a radial drill for tapping, facilitates changeover with a minimum of set-up time. Too, this practice requires only the simplest forms of special jigs so that changes in design may be accommodated conveniently and with but little outlay.

In the original engineering work on flywheel design, the machined surfaces and fillet radii are so designed that a single specially formed tool performs all of the operations by merely clamping the tools at proper angles.

All wheels are specified for balance within ½ oz.-in., balancing being handled on a Gisholt pendulum balancer fitted with an integral Leland-Gifford drill for balance drilling.

Packard

Producing four lines of motor cars, requiring three standard flywheels, Packard has found it expedient from the standpoint of operating economy as well as quality control to operate three different machine lines. The "Six" and "Eight" wheels, of the same size are run over one line; the "Super-Eight" over another. The routing reproduced here is typical of the set-up for machining flywheels for the "Six," "Eight," and "Super-Eight."

Flywheel castings are produced in Packard's own foundry to required standards of metallurgical quality, routed directly to the machine shops.

For balancing, the flywheels, crankshafts, and clutches are assembled together, then balanced dynamically. The vertical type balancing machine is used for the "Six," "Eight," and "Super-Eight." The assemblies are held within ¼ oz.-in.

Note that the clutch face is ground on a Heald rotary surface grinder, then polished.

Plymouth

Typical of mass production, this company produces only one size of flywheel on a special purpose machine line. Flywheel balance is held within 0.5 oz.-in.

Studebaker

In its current line, Studebaker has three passenger car engine flywheels and one truck engine wheel. With the exception of the truck engine wheel which is run over the Commander line, each wheel is processed over its own machine line. With a limited number of standard sizes this is the perfect solution so far as flexibility and production economy are concerned.

The routing reproduced here gives the sequence of operations for the Champion flywheel on an entirely new machine line, as is true of all Champion parts production. Latest type Gisholt Simplimatics are used for turning complete, followed by finishing of clutch face, gear fit, and crankshaft counterbore on Warner & Swasey and LeBlond lathes. Drilling of crankshaft bolt holes and clutch screw holes is done on a Natco 3-position rotary table drilling machine. A unique machine developed by Greenlee Brothers drills three angular oil holes and taps clutch screw holes in one operation.

A Calorac electric induction ring expanding machine is used for the assembly of the starting gear. Flywheels are balanced on a Micropoise balancing machine and held within ½ oz.-in.

Waukesha

Perhaps the most amazing commentary on the problems of the commercial engine builder is found in the practice at Waukesha where the factory management is forced to handle almost 3000 combinations of flywheel sizes, drilling, forms, etc., ranging in diameter alone from 11 in. to 38¼ in. Here, indeed, is a sizable problem of flexibility within the demands of commercial economy.

The situation has been met by the use of equipment possessing inherent flexibility, rapid changeover being accomplished by skillful design of universal jigs and tool set-up. Just to illustrate the principle we have reproduced two Waukesha routings—one for low production, the other for high production. The reader will note at once the basic difference in the type of equipment selected for each line, particularly the use of the Gisholt Simplimatic on the high production line.

However, all ring gears are assembled with the use of the Calorac induction heating ring expander. All wheels are balanced to 0.2 oz.-in.

Continental Motors

Due to the great multiplicity of flywheels required in the varied line of tractor, truck, and industrial engines built by this company, flexibility is achieved by the use of a number of separate machine lines all located in a single department. The routing reproduced here is an example of a typical line, this one being tooled to handle five different wheels.

Flexibility and economy of tool set-up are attained by the use of universal chucks fitted to each machine, accommodating the required range of chuck jaw inserts for the master jaws. In addition, each change requires a corresponding replacement of tools, blocks, and cams.

Here, too, the ring gear is fitted with the use of the Calorac induction heating machine. Wheels are

Allis-Chalmers Flywheel Routing

OPERATION	EQUIPMENT
Rough turn, face and counterbore crankshaft side	Gisholt Simplimatic
Rough bore, face and undercut clutch side	Gisholt Simplimatic
Finish bore, face and counterbore clutch side	Gisholt Simplimatic
Finish face and counterbore crankshaft side	Gisholt Simplimatic
Drill complete and ream hole	Bausch multiple spindle drill press
Countersink four holes and mark for timing	Bench
Tap six tap holes	Garvin single spindle tapping machine
Balance flywheel	Gisholt balancer
Wash	Blakeslee washing machine
Shrink on starter ring gear	Own make four stage oven

balanced statically on a No. 9 Gisholt machine and are held within a tolerance of ½ oz.-in.

Nash

This is another good example of a flexibly tooled machine line capable of handling all of the wheels on the same equipment. Three flywheels are produced here, the Lafayette, Nash "6," and Nash "8." The first two are of the same size—12¼ in. in diam., 1 27/64 in. in thickness: the other wheel is 13¼ in. in diam., 1 17/32 in. in thickness. Both sizes are run over the same line with suitable changes in tool set-up. Separate machines are employed for drilling and tapping of each size.

Flywheels are not balanced individually after machining, this operation being reserved for the final balancing of the complete crankshaft, clutch, and flywheel assembly. The unit is held to a limit of 3/10 oz.-in.

Cadillac

This company produces three different models of flywheels varying in size and design detail to suit 10 in. or 11 in. clutches. Due to the considerations of manufacturing economy, it was found desirable to select equipment possessing great flexibility so as to permit the machining of the entire line of wheels over the same machine line.

All of the flywheel castings are made in the Cadillac foundry using a plain grade of cylinder iron with Brinell hardness ranging from 167 to 207. Castings are made in individual molds. Then they are thoroughly cleaned in a Roto-Blast automatic, continuous shot blasting machine, flexibly tooled to handle not only flywheels but a variety of other parts as well.

First and second machining operations, as may be noted on the sample routing, are performed on Gisholt Simplimatics. The cycle of events is completely automatic. Work is held in a pneumatic chuck, the tooling being so designed that the substitution of jaw inserts, boring bars, and suitable cutting tools, makes each machine capable of handling all of the wheels in the line. Cemented-tungsten-carbide tooling has proved to be very successful on both machines, aiding in overall economy by greatly reducing the tool down time.

Nash Factory Flywheel Routing

OPERATION	EQUIPMENT
Rough face clutch and rough bore	Gisholt, Potter and Johnston
Rough face crank side	Gisholt, Potter and Johnston
Finish turn, bore and chamfer	Gisholt, Potter and Johnston
Finish face clutch side	Gisholt, Potter and Johnston
Drill six holes for clutch and 4 for crank	Baker drill
Ream 6 holes for clutch	Natco drill
Drill 2 angular holes	Leland-Gifford
Tap 6 clutch holes	Fox tapper
Shrink on starter gear	Gas heater
Indicate and inspect	

Following initial machining, the starter ring gear is assembled. First it is heated to 350-400 deg. Fahr., on an automatically controlled cycle Calorac Electric expander. Then it is fitted onto the wheel and pressed into place on an air-operated press. During the pressing operation, the ring is cooled by means of a blast of air so as to permit a normal cooling and shrinking. The assembly operation is inspected 100 per cent by a special torque testing machine, the ring being subjected to a torque of 33,000 lb.-in., which must be carried without slipping.

Quality control places exacting demands on the machining operations. For example, the clutch bolt circle diameter and runout of bolt holes must not exceed 0.004 in. indicator reading. Final finishing of the clutch contact surface is done after assembly to provide parallelism within 0.002 in. It is performed on a Sundstrand Automatic lathe fitted with a special rheostat control so as to produce a smooth, scroll-like finish, free from waviness, having a Profilometer reading of 120 micro-in.

Balancing is done on a G.M. vertical static balancing machine fitted with a universal fixture which takes all of the wheels, holding static balance within ¼ oz.-in.

French Competition for Airplane Design

FOLLOWING in the footsteps of the U. S. Government, which has been encouraging the production of a practical "flivver plane" for some years, the French government through its Air Ministry now is organizing a competition for the development of a cheap, simple, and safe two-passenger, cabin-type plane with a cruising speed of 100 m.p.h. and a radius of 375 miles. Prizes to the amount of 3,000,000 francs ($80,000) are attached to the competition. The plane must be of "rustic" design, simple to disassemble, maintain and operate, and it must be built entirely of French raw materials. Once a type has been selected from the competing designs, it will be declared the standard for civil flying, and the government will pass a large order. It plans to place these planes at the disposal of flying clubs which may pay for them in instalments. Entries for the competition closed on Aug. 1. The object, of course, is to foster the training of a large corps of pilots.

IN FRENCH Indo China all public trucking and transportation companies now are required to use native fuels in at least 25 per cent of the vehicles operated by them. The Governor-General has been authorized to advance money for the purchase of French vehicles built to use fuels that can be produced in Indo China, or for the conversion of existing vehicles to the use of producer gas.

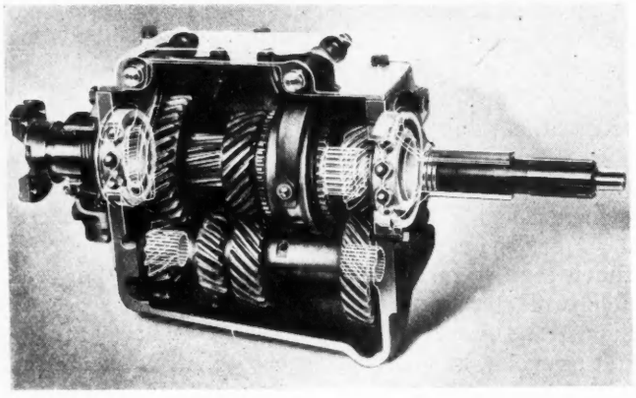
Packard Replaces Twelve with Custom Eight

(*Continued from page* 201)

There has been no change in the clutch set-up. Transmissions have been altered only in detail, the principal change being an increase in the capacity of the ball bearings.

There is a new rear axle on the 110. The axle for the 120 is the same as last year's; the axle on the 160 and 180 is the same as that formerly employed on the Super-Eight, namely, the 120 axle with a deflection-control bearing on the side of the ring gear opposite the pinion. Rear axle ratios have been materially changed and are now as follows: 110, 4.3; 120, 4.09; 160 and 180, 3.9, 4.09 or 4.36.

All engines are fitted with Thermo-Strut, aluminum-alloy pistons, tin plated. Tocco-hardened pearlitic malleable iron camshafts are continued, with four bearings on the 110, five on the 120, eight on the 160. A



Cut-away view of transmission

floating oil screen and a crankcase ventilator are standard on all models.

For 1940 Packard has developed a new overdrive which is built by Warner Gear. The Econo-Drive, as it is called, employs the same type of gear mechanism as used last year but the formerly used combined built-in centrifugal governor and clutch are omitted, and the slotted head on the sun gear with its pawl, which formerly was used only for locking out the overdrive, now effects all changes from direct drive to overdrive and vice versa. An external governor, a small independent unit, controls the action of this pawl.

As shown in the partly sectioned rear elevation of the overdrive, the centrifugal governor is mounted externally at the rear of the unit and is driven from the same gear as the speedometer drive shaft. The governor actuates a switch incorporated with it, which opens and closes a circuit at the car speeds for which it is set.

The slotted sun-gear hub and its engaging pawl are the same as before, the pawl being operated by a solenoid, which now, however, pushes the pawl into engagement, instead of pulling it out. In normal driving the solenoid is "dead," and a spring keeps the pawl out of engagement with the slotted sun-gear hub. When the road speed for which the governor is set (18 to 19 m.p.h.) is attained, the latter closes the solenoid circuit, and the solenoid then moves its plunger toward the axis of the overdrive shaft, against a spring, thereby putting a spring load on the engaging pawl. A friction balk-ring, carried on the sun-gear hub, prevents the pawl from actually engaging until the foot has been taken from the accelerator and the engine allowed to slow down to the speed of the sun gear. As the two parts come into synchronism, the reversal of the drive causes the balk ring to swing out from under the pawl, allowing the latter to engage into one of the slots in the sun-gear hub. The overdrive train is thus engaged. In this way the driver is in position to delay the engagement of the overdrive beyond the actual instant of governor action.

When the pawl is fully engaged, the main solenoid circuit is broken, the pawl being held down by a small holding coil which overcomes the spring pressure. This coil is said to consume very little current.

To get out of overdrive when above the governor speed, the procedure is exactly the same as with previous models; that is, the driver presses the accelerator pedal beyond the wide-open position, which opens the solenoid circuit and also momentarily cuts the ignition circuit, so that the torque is reversed, which gives the spring a chance to withdraw the pawl from the slot. As soon as the pawl is out of the slot, it closes a contact and restores ignition.

An extra circuit in the solenoid operates an indicator light on the instrument board. When the car has passed the cut-in speed, the lamp lights up and continues to burn until the driver has taken his foot off the accelerator enough to cause a reversal of torque and engagement of the overdrive. The light thus serves as a warning to the driver that he is not taking advantage of the overdrive.

So far as the gearing of the overdrive unit is concerned, the unit for the 110 and 120 use a three-pinion planetary, while that for the 160 and 180 is provided with a four-pinion arrangement.

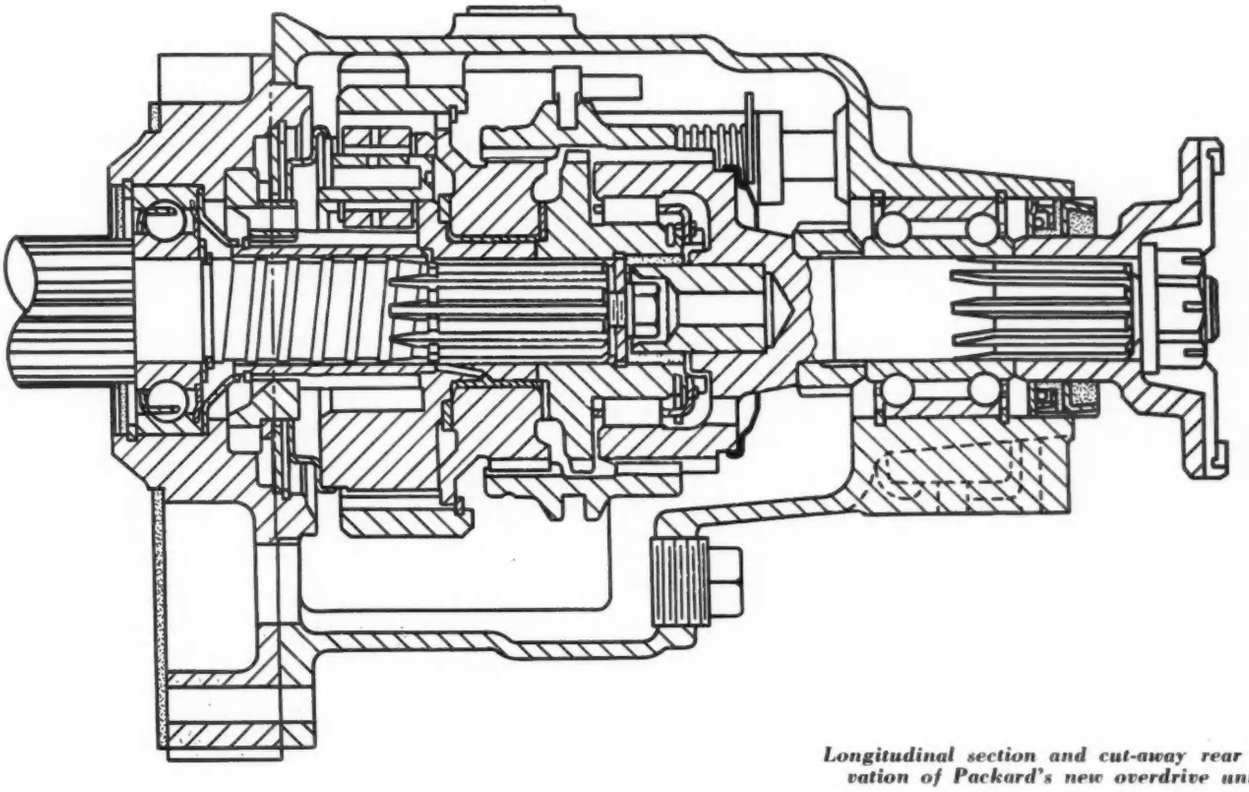
While the front-end suspension remains the same as before, mechanically, the torque arm on all short-wheelbase jobs is attached to the frame by means of a new Harris bushing instead of by a spherical bearing, the latter being continued on the long-wheelbase models.

Front shock absorbers on all short-wheelbase models are new, being of the double-acting, parallel-cylinder type. On the long-wheelbase models, the double-acting end-to-end-discharge type shock absorbers are employed at both front and rear.

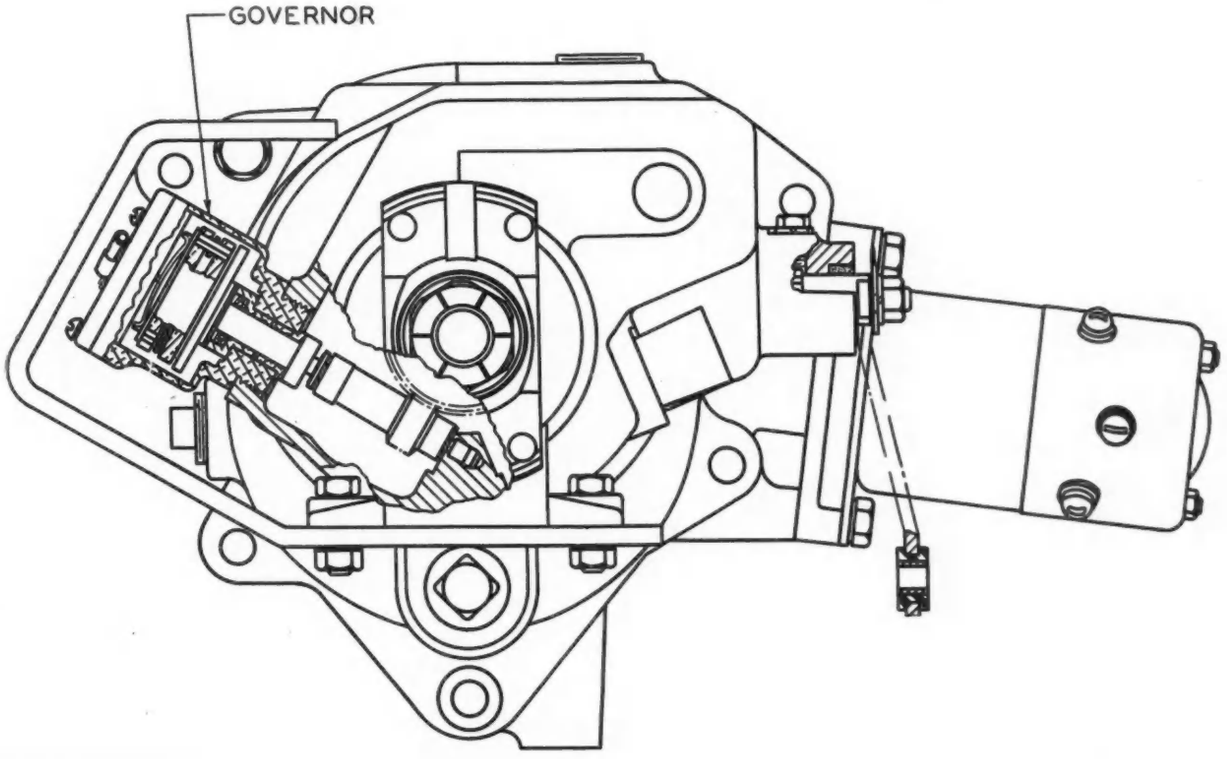
Large direct-acting shock absorbers are used at the rear end on all short-wheelbase models. On the 110, the fifth shock absorber has been eliminated, stabilizer action being achieved by mounting the direct-acting shocks so that the upper ends incline toward the center of the chassis. The fifth shock absorber is continued on the other chassis, and on the short-wheelbase jobs the direct-acting shock absorbers are inclined forward.

On the short-wheelbase chassis the sway bar has been moved from the rear to the front. On the 160 and 180 long-wheelbase jobs there are sway bars at both front and rear.

Packard has been using inserts for controlling the interleaf friction of its rear springs. However, for 1940 the antimony-lead inserts have been replaced by buttons fitted with Silenite inserts, and the springs now have rubber and Silenite inserts.



Longitudinal section and cut-away rear elevation of Packard's new overdrive unit



Tension shackles are now used for rear spring mounting on all short-wheelbase chasses. These shackles are held in a special hanger designed to absorb vibration.

As in last year's cars, rubber is used generously throughout the running gear and there is no metal-to-metal contact between the springs, the running gear, and the frame.

The standard body models, of all-steel construction and built in the new Packard body plant, incorporate many detail, structural and appearance changes. In addition to standard bodies, Packard offers a number of special bodies on the Custom 180 which will be built by Packard and outside custom builders. The interior treatment is new, with new instrument panels on all models. On the Custom 180 the instrument panel is composed of large plastic sections.

The speedometer is new, and incorporates a pointer of Lucite which conducts the light beam from a small electric bulb at the rear of the instrument. It shows three different colors—green for the traffic range, amber for speeds up to fifty, red for speeds above fifty. This is especially useful as a safety feature in night driving.

The 2-4 passenger coupe is equipped with folding "occasional" seats. Convertible coupes on all models have a power-operated top mechanism consisting of two vacuum cylinders actuated by a single valve at the front.

Seat cushions on the 160 have a foundation of luxury springs with a pad of soft foam rubber sponge, 1⅝ in. deep for the cushion top. On the 180, there is a foundation of Marshall springs, with a thick pad of soft foam sponge rubber, topped by soft, luxurious down cushions.

Insulation against heat and sound has been incorporated in the bodies at the roof, panels, doors, cowl, floor, and trunk. Panels at the rear quarter are covered with a dense blanket of padding, while the wheelhouse section is sprayed with a sound-deadener. Doors are sprayed with a thick, viscous asphaltic sound-deadener. Top and sides of the cowl are lined with a heavy jute blanket, cemented in place. The dash is insulated by a 1-in. layer of a special material, then covered with leatherette insulating board. The floor, front and rear, is treated with a thick layer of asphalt-impregnated felt, supplemented by a heavy jute pad cemented on the under side of the carpet and rubber mat. Trunk lid and sides are heavily sprayed with sound-deadener, then coated with sprayed-on flock which produces a tinted suede finish.

Body mountings insulate the body structure at twenty points, using special rubber-impregnated fabric insulators possessing high noise damping quality.

Head lamps are of the torpedo type, with longer bodies, finished with a top "wind-split" of chromium. Light bulbs are of the "Sealed Beam" type. Windshield wipers on the 160 and 180 are of the vacuum type and are served by an auxiliary pump.

Tire sizes on the different models are as follows: 110, 6.25-16; 120, 6.50-16; 160 and 180, short wheelbase, 7.00-16 four-ply; 160 and 180, long wheelbase, 7.00-16 six-ply. The 180 of 148-in. wheelbase carries tires made with rayon twist cords.

Cleaning Up the Rat's Nest

(*Continued from page* 209)

solved by one maker through experiments which showed that a small motor-driven blower and heater unit under the cowl and taking very little space, could be made to draw air from the car interior and distribute it over the windshield so as to prevent frosting. This also involved less defroster piping than is used in some conventional arrangements.

As to control elements themselves, many types are available. Flexible shafts may be had for controls which require only rotation or for both rotation and push-pull. Bowden wire controls may be used for push-pull applications. Simple linkages of various types are suitable in certain cases and the utility of electrical controls is too obvious to require comment. None of these controls is expensive and some of them are needed even when under-cowl radios and heaters are employed. It is no great problem to make them effective even if they have to be lengthened because of such changes in location.

Naturally, some drawbacks may be found for almost any rearrangement of the units above discussed. But these disadvantages deserve to be set off against the advantages and the combination which yields the best net result chosen. In such a listing, cost has to be given due weight, but when one is considering a heater for which the car owner pays $9 to $25 extra, and a radio for which he pays $35 to $75 extra, the matter of best possible performance of these units in service should not be overlooked. To gain this, some extra cost to the car manufacturer is not hard to justify.

However one may look at the matter, it is not by any means a foregone conclusion that the present typical layout is the best possible, all things considered. Reasons advanced for some other layout warrant study. If some improvement does not occur, it will be the first time that a thorough study of faults in motor car design has not led, in the end, to some worthwhile betterment.

A COMMITTEE on Tractor Fuels of the Society of Agricultural Engineers has put forward a proposal for a standard tractor fuel for use in engines of low compression ratio—the socalled distillate-burning engines. It is to be known as No. 1 tractor distillate and to have a minimum octane number of 30. Minimum distillation temperatures specified are 325 deg. Fahr. at the 5-per cent and 464 deg. at the 95-per cent point; maximum temperatures, 400 deg. at the 10-per cent, 420 at the 25-per cent, 515 at the 95-per cent, and 540 at the end point.

Hudson Announces for 1940

(*Continued from page* 207)

the back of the front seat has a recess that is emphasized by a robe cord. Rear seats have upholstered armrests. Interior decorative features include chrome-plated metal strips on the doors, twin ash trays inset the rear-seat armrests, assist cords, and tapestry carpet with recessed, carpeted foot rests. Front dome lights are standard in all models, while Country Club sedans have an additional rear dome light. Garnish moldings have a dark-grained walnut finish.

In the Super Six and Eight the upholstery, in gray herringbone wool twist, is of a tufted and paneled design, with piping in a contrasting color. The armrests have inset chrome ash trays, with plastic handles to match the hardware. Seat tops are deeply rolled and the backs of the front seats contain a convenient extension-type pocket for small parcels.

The Airfoam seat cushions now have a paneled seating surface, while their under surface is molded in a series of pillow-like pads that enhance seating comfort. These cushions are used in combination with a multiple-coil-spring seat construction; they are standard on all except the Hudson Six and the Hudson Six DeLuxe, where they are optional at extra cost. Reference has been made already to the upholstery of the Country Club models, which is in a two-tone tailored design, the seat backs, armrests, door paneling and seat bases being in a lighter tan color, while the remainder is a deep brown. Chromium molding is used over the lining on the doors. The rear seat has a pull-down armrest and the recessed back of the front seat includes a locker. Interior hardware includes a robe rail, chrome beading around the top of the front seat, a pendant door pull-to, metal kickplates at the bottom of the doors, twin ash trays in the rear-seat armrests, a cigar lighter in the right rear quarter panel, and satin-finish-chrome garnish molding for the instrument panel. Mohair upholstery is optional on all models.

In the new instrument panel there is a central chrome-plated grille which conceals the radio speaker (if installed). Instruments can be easily read through the two-spoke steering wheel and are protected by lenses of plastic material. The equipment this year includes a separate odometer dial with magnifying lens which enables mileages to be checked readily. Electric clocks are furnished on Country Club sedans, regular 30-hr. clocks on all other models. The package compartment in the instrument panel has been enlarged.

Country Club models have 18-in. steering wheels of plastic construction. These wheels are available (at extra cost) also on the other models, which normally come with 17 in. wheels of the conventional molded type.

To increase the field of vision, the depth of the windshield has been increased 2 in. Rear vision also has been improved, by the adoption of a one-piece curved rear window of larger area conforming to the lines of the rear panel. Chrome moldings on the rear window harmonize with the die-cast rear license holder, while the new tail lights, mounted flush with the rear fenders, are contoured to blend with the fender lines.

New door locks are used on all 1940 models. As the door is closed, the pivoted striker device is partly rotated to permit the bolt to pass the striker member, so that the doors can lock with a smooth wedging action.

In the Hudson Six, the engine power has been increased from 86 to 92 hp. by improvement in carburation and the use of a higher compression ratio (7 to 1). Transmission ratios have been changed to give 20 per cent more maximum rear-axle torque in low-gear, and 11 per cent more in intermediate gear. In the Super Six and the eight-cylinder engines of 118-in. wheelbase models the carburation also has been improved, these models now having a dual downdraft 1-in. carburetor with automatic heat control, automatic choke, simultaneous accelerator jets, and anti-percolator. In the Super-Six the spark timing is vacuum-controlled. Engines in the 118-in. wheelbase eight and the 125-in. wheelbase Country Club eight have a 1¼-in. dual downdraft carburetor.

The "Fluid-Cushioned" automatic clutch is continued as an optional extra for 1940. Where overdrive is used, a special oversize driving disc will be incorporated in the automatic clutch. The clutch pedal pressure is said to have been greatly reduced.

A new cellular-type radiator core is used, which improves the circulation.

It may be recalled that in the Hudson braking system the brakes are normally applied by hydraulic pressure, but if the hydraulic system fails, they are applied mechanically by a reserve linkage actuated by the same pedal. This reserve linkage has been redesigned. The parking brake also has been improved. The gear-shift with column-mounted shift lever has been improved to increase the travel of the shift lever and make the mechanism more quiet.

Rear axle tubes have been increased in diameter from 2¾ to 2⅞ in., and there is a larger radius where the tubes join the center housing. Gears remain the same, but an optional ratio of 4⅞ is now offered on Hudson Six models. The thrust washer for the drive pinion, formerly made of Bakelite, is now made of bronze.

In the six-cylinder models the distributor unit is now located above and at the rear of the engine, where it is more accessible and permits of the use of shorter high-tension wires. A vacuum advance has been added to the equipment of these engines.

All generators have ventilation and voltage control. Electrical terminals exposed to the weather, such as those of the headlamps, lighting switches, and fuse holders, are now silver-plated, to prevent oxidation of their contact surfaces and consequent voltage losses.

Two radio receivers are available. One is a six-tube set with 6-in. speaker, the other a seven-tube set with an 8-in. speaker. Both are mounted in the instrument panel grille and have a five-station push-button selector. The seven-tube set has a two-step tone control. the six-tube set an inherent tone control.

All models have draft-free ventilation. In the Six DeLuxe, Super-Six, and Eight models the front ventilating wing is of the latch type, and in all but the Six models, sliding rear-quarter windows are crank-controlled. In the Country Club models the front window deflectors also are crank-controlled.

All body finishes are in opalescent lacquer, except black, Morocco red, and California cream, which are in regular lacquer. Morocco red and California cream are extra cost on all models. Colors standard for all series and body types are harbor blue, gunmetal blue, Baltic blue, maroon, pearl grey and queen grey. Standard on all models except the lowest-priced are Naples tan, sage green, radiant grey and jay blue.

Tire sizes are 16 x 5.50 on the lowest-priced Six; 16 x 6.00 on the Six DeLuxe, Super Six and Eight; 16 x 6.25 on the Country Club Six, and 16 x 6.50 on the Country Club Eight.

Bodies available on the Six DeLuxe, Super Six and Eight include two- and four-door sedans, a three-passenger coupe, four-passenger victoria coupe, five-pasenger convertible coupe, and a convertible sedan.

Convertible cars have hand-buffed leather upholstery, except those in the Six DeLuxe series, which have upholstery in deep-buffed leather. All seats are adjustable within a 5½-in. range, and in the convertible cars they move in arc for ease of entry and exit. Improved fresh-air car-heater units are available as an extra on all closed-body models.

Death Takes A Holiday

(*Continued from page* 192)

tistics of many claim cases bore out this theory.

By 1936 the four classifications were revised to three—"tin cans," "automobiles," and "luxuries."

But in the meantime the Ford Motor Co. brought out its Model "A" in December of 1927. Other manufacturers brought out attractive, powerful, small cars, and many monied drivers were no longer ashamed to drive smaller cars. Many families bought a second car, and with the 1929 depression, this cheaper size of automobile came into wide use. The distinction between comparative financial responsibilities of owners could no longer be measured by the size of the car they drove.

Today, all passenger cars are under only one classification for casualty insurance. The day has gone, underwriters hold, when the mere fact that an automobile is big and expensive means that it needs to carry more casualty insurance than a small car. Collision rates, however, are based on the cost of the car.

In the meantime, other factors in automobile casualty insurance rating were being developed through the arduous trial and error method. In 1921 a radical innovation was made in rating with respect to both the extent of the coverage, and the use to which the automobile was put. The coverage previously written was continued as the so-called basic coverage for which the basic rates in the manual were charged, and under which the cars insured could be operated by any driver for pleasure or for business. Then there were two forms of so-called restricted coverage under which the insured cars could be used only for "private purposes." This was then defined as including "personal, pleasure, and family use, excluding the regular and frequent use for business and professional calls, and excluding commercial delivery." The rates for this restricted use were 8 per cent less than the basic rates if the insured car was operated by any driver, and 20 per cent less than the basic rates if the car was operated by the owner and no one else.

From 1921 to 1923 it was found that insurance written at the 20 per cent reduction rate required rates as high or even higher than the insurance written at the full basic rates. In other words, experience exploded the theory that business use was an added hazard, and that cars driven only by the owners presented a reduced hazard. The factor of the insurability of the individual, whether he was the owner or not, was beginning to get the attention of the underwriters.

An analysis of the various rate structures since the dawn of automobile casualty insurance shows clearly how the idea of rewarding careful drivers grew slowly out of actual experience. It took from 1904 to 1929 to convince the majority of rate making experts that the individual driver, rather than the type of work the car performed or the automobile itself, was the crux of casualty insurance.

The Merit Rating Plan of 1929 was superimposed upon the three classifications which had survived, W, X, and Y. This plan gave an advance discount of 10 per cent to drivers who attested to the fact that their record for the past 21 months, ending three months prior to the policy inception date, was clear of accidents for which claims had been made, and that the driver's license of the insured had not been suspended or revoked for certain causes.

False claims brought about the abandonment of this plan in January, 1932. A somewhat similar plan was put into effect from that date to 1937, and this again failed. The principle was conceded to be the right one, but false claims were all too numerous.

The new plan of rewarding the driver at the *end*

of the policy period instead of at the *beginning* follows somewhat the principle of rewarding drivers for being careful, yet permits the underwriters to reward safe drivers only.

As a matter of fact, it appears that only about 15 per cent of automobile drivers cause 100 per cent of the accidents. Students of the highway accident problem have found that there are accident-prone people. As in other fields, accidents have a way of happening time and again to these accident-prone people.

The Automotive Safety Foundation, National Safety Council, the American Automobile Association, local safety organizations, and many other groups have been educating the public to realize that safety is a personal problem. The result of this widespread educational effort, expended upon children and adults alike, is showing marked results.

The direct appeal to the driver's pocketbook can be counted upon to further decrease street and highway accidents. The prospect of a rebate emphasizes the "rules of the road," and the silent command of the stop light.

British Tax Prompts Revision of Hp. Formula

THE recent increase in the annual tax on passenger cars in Great Britain, from 15 to 25 shillings per "formula" horsepower, has revived the complaint that the R.A.C. formula used to compute the horsepower has caused British manufacturers to develop small, high-speed engines which do not find ready acceptance in overseas markets, and, therefore, has hampered British export trade. The subject was brought up in Parliament, and Sir John Simons said he was quite willing to consider any new formula which the manufacturers might suggest, a formula taking account of the piston stroke, and possibly also of the speed of revolution, provided it did not reduce the tax revenue.

As the present formula takes account of the bore only, besides the number of cylinders, one might expect it to encourage reducing the bore and lengthening the stroke, as the output is influenced by both stroke and bore. Actually it seems to have had little effect in that direction. For instance, in the United States the average stroke/bore ratio of all 1939 passenger-car engines is 1.31, while for British 1938 engines it is 1.43. It is not even certain that this difference between the stroke/bore ratios is due entirely to the higher horsepower tax in Great Britain, for there is a natural tendency among engine designers to use a greater stroke/bore ratio for small-bore engines, and vice versa, and British engines have smaller bores on the average. In fact, the average British bore of 2.84 in. is approximately 12 per cent smaller than the average American bore of 3.24 in., while the average British stroke of 4.06 in. is equal to 96 per cent of the average American stroke of 4.32 in.

As long as the stroke/bore ratio remains within reasonable limits, the piston displacement is a fair measure of the output of which an engine is capable. Now, the average piston displacement of British car engines is 139 cu. in., or only 55 per cent of the average American displacement of 255 cu. in. Therefore, the chief effect of the high horsepower tax in Great Britain has been to cut down the piston displacement, and the effect on the stroke/bore ratio has been of a minor character. Since the average revenue per car is to at least remain the same, if a change were made to a horsepower formula based on piston displacement, it would penalize owners of cars with long-stroke engines and ease the burdens of those owning cars with short-stroke engines. But since the stroke/bore ratio varies only within relatively narrow limits, the shift in tax burdens would not be great. On the other hand, as the general tendency of the higher tax will be to further reduce displacements, foreign trade in British cars is likely to be adversely affected by it. A compensatory effect is likely to be that car imports into Great Britain will decrease, as imports have been chiefly of the higher-powered type, the demand for which will be cut down by the higher tax.

Torkondif Continuously Variable Transmission

(*Continued from page* 204)

accelerator and applies the brakes. The units of the transmission back of the determinator, being coupled to the driving wheels, then "free-wheel." As the inertia wheel then runs ahead of the engine flywheel, the cams of the determinator are automatically returned to the neutral position.

Free-wheeling, therefore, is inherent in this form of transmission, and a no-back feature also is incorporated in it. While the engine cannot be used as a brake, this can be provided for in the design of the transmission or by using a power brake.

The drawings and photographs reproduced herewith represent an experimental unit, and certain changes would be made in a production unit, which latter would replace the present flywheel, clutch and gearbox. A later design of the Clerke Torkondif is inherently reversible and is controlled by means of three push buttons through a solenoid. Pushing one button sets the transmission for forward drive, another for reverse, while the third button (all buttons being suitably marked, of course) brings the gear back to neutral. This reversible transmission cannot be described in detail at present owing to the patent situation.

MEN AND MACHINES

(*Continued from page* 212)

operated draw rod. In operation, the lever at the upper right hand side (see illustration) is engaged, which in turn automatically starts the spindle. The spindle of this machine is run at approximately 150 r.p.m.

In the first part of the cycle of the superfinishing operation the roughing stones are drawn automatically into the surface. As the cycle of the operation progresses the finish stones are brought to bear automatically shortly after the roughing stones are withdrawn from the surface, leaving the finishing stones to complete the remaining few seconds of the super-finishing operation. Total time required for the entire operation on an 11-in. drum is approximately 15 sec. At the end of the cycle, through the use of a brake type motor, the stone slides move back into their starting positions and the spindle stops automatically for the unloading of the part.

The brake drum is superfinished to a profilometer reading of approximately 10 micro-inches. A better micro-inch surface may be obtained by varying the cycle of the machine. In almost all cases a 10 micro-inch finish is considered especially fine for a brake drum surface.

We have received an interesting account from the Linde Air Products Co. of how one manufacturer has solved a knotty production problem of flame-hardening the teeth of rear drive sprockets for a popular make of tractor. Sixteen sprockets are gang-hardened at a time, and the trick in doing this job successfully is to make sure that the nested parts are clamped together tightly, inasmuch as any space between the parts would result in a non-uniform case. In this instance, the 16 sprockets, supported by an arbor, are drawn together by taking up on the nut shown in the illustration on page 211.

Each of the sprockets is 26⅛ in. in diameter, has 27 teeth, and is made of SAE 1045 steel. Hardening is performed with two 2 D.P. gear-hardening heads attached to blowpipes which are driven by a cutting machine. A speed of 7 in. per min. produces a ⅛-in. to 3/16-in. depth of case having a hardness of 70 Scleroscope.

A new small arc welding machine has been announced by the Lincoln Electric Co. The new welder, known as the "Shield-Arc Junior," is rated at 200 amp. and its current range, welding duty, 30-volt arc, is 60 to 250 amp. Outstanding feature of the equipment is the system of voltage and current control with which it is equipped. This system of control, known as "Dual Continuous Control," now made available for the first time on a small belt-driven model, permits independent adjustment of voltage and current, giving complete and separate control of arc heat and arc penetration for easy, speedy welding of any job.

The American Broach & Machine Co.'s T-6-24 threeway hydraulic broaching machine illustrated on page 210, was furnished recently to a manufacturer of automotive jacks for broaching the ratchet teeth on the bars of bumper type jacks. The work, which is shown lying on the work table in front of the fixture, is loaded two pieces at a time into the indexing tilting fixture. The operator then tilts the fixture forward into broaching position, clamps the work, and pulls the operating levers of the machine to bring the ram down to broach the first 13 teeth. At the bottom of the stroke the operator tilts the fixture back to loading position, unclamps the work, reverses the ram and indexes the work laterally to its next broaching position while the ram returns to the top of its stroke. The process is then repeated until, after five strokes of the ram, all 65 teeth have been broached. Production obtained from this machine is said to be 130 completed pieces per hour at 100 per cent efficiency.

July Machine Tool Index Brings Three Months' Average Above 200

The high activity in machine tool orders that characterized the demand for May and June continued through July. For three successive months the index prepared by the National Machine Tool Builders' Association has held above 200, bringing the three months' average above 200 for the first time since the first half of 1937.

While sustained foreign demand accounts for approximately half the total volume, the Association states that gradual improvement in the distribution of orders throughout the industry indicates a broadening domestic demand, though at a volume considerably under that of 1937, or even under 1936 when domestic orders accounted for 75 per cent of the business placed.

A two horsepower oil power variable speed transmission especially designed for machine tool applications has been brought out by the Sundstrand Machine Tool Co. It provides a speed range steplessly variable from 10 to 3000 r.p.m. and is suitable for either speed or feed drives. Features are an exceptionally high overall efficiency with high starting torque at low speeds. The manufacturer states that there is no power loss in accelerating from standstill to maximum speed or in starting and stopping. No valves are used in reversing and there are no rotary valves. Pump and motor valves operate at only 1/20 the surface speed of rotary valves.

Recent development coming out of the Tannewitz Works is a new 36-in. high-speed sheet metal cutting band saw. This machine, designated as type GHE-36 in., is equipped with Lockheed-Wagner hydraulic brakes, synchronously operated, which operates when the stop button is pressed to bring the machine to a stop within four or five seconds. The brakes also act automatically in case of emergency caused by saw breakage and stop the machine instantly without any attention on the part of the operator. With this equipment it is possible to saw sheet metal up to ¼ in. at production speeds. On 16 gage sheet metal the rate of feed is approximately 6 in. per sec.

Other new developments in machine tools and allied products on which details have just been released are: An instrument for use in determining certain mechanical properties of rubber and rubber-like materials as vibration absorbers which has been designed by the American Instrument Co., Silver Spring, Md. . . . The Chicago Rivet & Machine Co.'s multiple setter employing a movable anvil which is actuated by a solenoid. Design of this machine permits the employment of a special indexing fixture whereby the application of multiple settings to the line assembly of small parts becomes more practicable. . . . Elastic Stop Nut Corp.'s announcement that, in addition to its standard line of self-locking nuts, these nuts can now be furnished on order in any metal and in any combination of style, size, and thread system. . . . The "All Purpose" tool post grinder now being manufactured by R. G. Smith Tool & Mfg. Co., Newark, N. J. . . . The photo-electric counting equipment, model 566, and general purpose contact relay, type 566, recently completed by the Lipman Engineering Co., Pittsburgh, Pa. . . . Redesign of five drills made by the Black & Decker Mfg. Co.—the ½ in. Utility, ⅜ in. Heavy Duty, ⅜ in. Utility, 5/16 in. Heavy Duty, and the ¼ in. Heavy

(*Turn to page* 244, *please*)

NEWS OF THE INDUSTRY

Three Years of Joint Research Yield New Headlighting System

"Sealed Beam" Lamp Units Will Be Employed on Virtually All 1940 Model Passenger Cars

The latest development in automobile headlighting, just announced by the industry through the Automotive Safety Foundation as the "Sealed Beam Headlight System," is the result of three years' cooperative research and testing by the entire automobile and headlighting industry, with the collaboration of public authorities. It probably will be employed on virtually all of the 1940 model passenger cars.

While the new equipment involves some changes in the present automobile lighting plant, the distinguishing feature of the system is the lamp unit itself. For the first time the reflector, light source and lens are made in a single, permanently sealed unit. It cannot be opened, and each element is adjusted at the factory in correct, unchangeable relationship to the others.

Among the advantages which will derive from use of the new system are mentioned the following: More light, properly distributed is thrown on the road surface; No dirt, dust or moisture can penetrate the sealed unit to film, corrode or fog reflecting surfaces and lens; Longer-lived filaments make for infrequent replacement, but when a light does burn out the entire unit is replaced easily; Being sealed, the lamps should not lose more than a small fraction of their efficiency throughout life, and with replacement the car owner may anticipate new-car lighting efficiency as long as the vehicle is on the road. A screw driver is all that is needed to install the new device or to adjust the direction of a beam; and, All makes of sealed beam lamps are

(*Turn to page 236, please*)

New $300,000 Driveaway Building at Lincoln Plant

Ground has been broken for a new driveaway building to cost $300,000 which is to be constructed immediately at the Lincoln Motor Company plant in Detroit. A similar building to cost $500,000 is now under construction at the Ford Motor Co. Rouge plant.

GM to Pay Dividends of 75 Cents on Sept. 12

General Motors Corp. has declared a dividend of 75 cents per share on the outstanding common stock, payable Sept. 12, 1939, to stockholders of record Aug. 17, 1939.

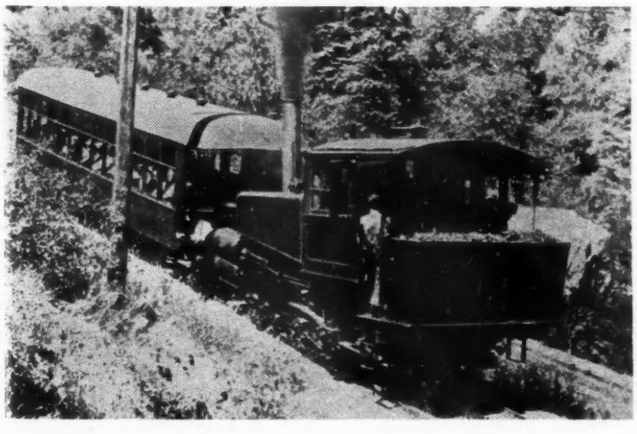
The regular quarterly dividend of $1.25 per share was declared on the $5 Preferred Stock, payable Nov. 1, 1939, to stockholders of record Oct. 9, 1939.

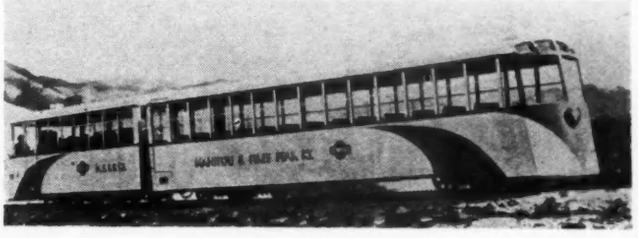
"Sealed Beam" Lamp

The girl holds one of the lamp units used in the new "Sealed Beam Headlight System" which is described on this page. The sealed beam lamp is said to be the most precise optical device turned out in mass production at the present time.

Chrysler Dividend

The Chrysler Corp. has declared a dividend of $1.50 per share on the common stock of the corporation payable Sept. 13, 1939, to stockholders of record Aug. 24, 1939.





Diesel Replaces Steam

After many years of faithful puffing up the steep grade to the summit of Pike's Peak, the steam locomotive at the left has been replaced by the streamlined Diesel-electric shown above. Both the old and the new, contrary to ordinary practice, push rather than haul the 50-passenger cars up the sharp incline.

NEWS

MEN . . . . . .

Joseph Jandasek, formerly with the Marine Division of Bendix Aviation Corp. in Brooklyn, has been appointed research engineer of the Hydraulic Brake Co. in Detroit.

J. H. Lemons has been named zone manager for Oldsmobile in New York City to succeed William Crossley, former New York zone manager, who died recently. **D. A. Hickey** has been named zone manager at Washington, D. C., to fill the position formerly held by Mr. Lemons.

Robert E. Hunt, formerly in charge of engine development for the Reo Motor Car Co., has joined the Wilkening Mfg. Co., Philadelphia, as engineer in charge of research and product development.

Daniel C. Sayre, associate editor of *Aviation Magazine* and aviation editor of the *Magazine Newsweek,* has been named director of statistics and information for the Civil Aeronautics Authority. Former associate professor of aeronautical engineering at Massachusetts Institute of Technology, Mr. Sayre succeeds C. B. Allen, who was named a member of the CAA's Air Safety Board several months ago.

Ray Fussell, until recently engaged in sales promotion activities in New York for the Nash Motors Division of Nash-Kelvinator Corp., has been appointed merchandising manager.

Fred W. Cederleaf, formerly general manager of the Diesel Equipment Corp., Chicago, has been appointed factory manager of the Dodge Mfg. Co., Mishawaka, Ind. This company is one of the oldest producers of industrial transmission equipment, including many precision elements.

W. H. Spencer has been named manager of the foundry division of the Wilkening Mfg. Co., Philadelphia. Mr. Spencer was formerly technical director for the Sealed Power Corp., Muskegon, Mich.

A. R. Code, a petroleum technologist and chartered mechanical and automotive engineer of Melbourne, Australia, has prepared an English translation of a biography of Dr. Rudolf Diesel by his son, Dr. Eugen Diesel, and is now arranging for its publication in book form.

Paul S. Menough, formerly with the Duraloy Co., Michigan Steel Casting Co., and Michiana Products Co., is now chief engineer of the Standard Alloy

Transportation of New Automobiles

The Tabulation of a Survey Made by the Interstate Commerce Commission of the Distribution Among Different Types of Carriers of Automobiles Shipped Out of Factories and Assembly Plants

The appended table is based on returns submitted voluntarily by manufacturers to a questionnaire prepared by the Bureau of Statistics of the ICC. Of the passenger cars shipped out of factories and assembly plants during 1938 by all manufacturers, with the exception of Hupp Motor Car Corp., more than half or 54.9 per cent of the total were handled on the highways, while railways claimed 37.7 per cent and waterways only 7.4 per cent.

Common carriers and contract carriers handled about the same number of units on the highways, 481,367 and 420,295 respectively. Dealers and distributors accounted for 209,111, and the remainder—34,869—were delivered at the factory direct to the ultimate purchasers.

In the very near future the ICC plans to issue similar data for each manufacturing plant and assembly plant, and also additional data on the cost to the manufacturer of preparing new automobiles for shipment by each type of transportation, and the reasons for using such transportation.

Following this the ICC also will prepare summaries of the carriers' returns to a questionnaire showing volume of traffic handled by various routes, the freight charges, and the carrier earnings per car-mile, per highway unit mile, and per ton-mile.

ITEM	American Bantam Co.	Chrysler Corp.[1]	Ford Motor Co.[1]	General Motors Corp.[1]	Graham-Paige Motors Corp.	Hudson Motor Car Co.	Nash Motor Div.	Packard Motor Car Co.	Studebaker Corp.	Willys-Overland Motors	Total
1. Distribution of total number of passenger automobiles shipped out of factories and assembly plants during the year 1938:											
1.1 By railway—Number	608	164,321	98,370	464,861	1,300	19,514	10,296	17,939	8,952	1,400	787,561
% of total	16.9	36.7	20.0	48.6	37.1	42.0	32.2	36.9	20.0	9.7	37.7
1.2 By highway—Number	2,117	187,345	369,639	477,535	1,837	21,047	21,721	18,929	35,778	12,406	1,148,354
% of total	58.8	41.8	75.0	49.9	52.4	45.3	67.8	38.9	80.0	86.1	54.9
1.3 By waterway[2]—Number	874	96,584	24,922	14,712	371	5,887	.....	11,742	.....	606	155,698
% of Total	24.3	21.5	5.0	1.5	10.5	12.7	.....	24.2	.....	4.2	7.4
1.4 Total	3,599	448,250	492,931	957,108	3,508	46,448	32,017	48,610	44,730	14,412	2,091,613
2. Distribution of automobiles shipped out by highway (shown in 1.2 above) among those that held themselves out to be:											
2.1 Common carriers	130	18,657	264,810	132,347	205	[7]12,148	16,262	14,386	16,095	6,327	[7]481,367
2.2 Contract carriers	[5a]1,495	12,713	81,266	318,441	.....	[7]87	1,817	.....	5,591	380	[8]420,295
2.3 Dealers and distributors	446	146,968	17,427	12,230	1,490	6,887	2,546	3,045	12,472	5,600	209,111
2.4 Customers[3]	46	9,007	6,136	14,517	142	708	1,096	1,498	1,620	99	34,869
3. Percentage of total of outbound automobile shipments during the first three months of 1938, prior to the effective date of railway rate increases authorized by I.C.C. decisions in Ex parte 123, delivered to:											
3.1 Railways	16.0	50.9	[4]20.0	[5]53.0	43.1	54.0	51.0	50.5	[9]30.0	10.0	.....
3.2 Common motor carriers	7.0	4.3	[4]46.4	[5]——	30.0	27.0	33.5	45.8	[9]27.0	25.9	.....
3.3 Contract motor carriers	[5a]40.0	2.2	[4]25.0	[5]45.5	.....	.....	7.0	.....	[9]10.0	10.1	.....
3.4 Water carriers	27.0	1.4	[4]4.6	[5]0.7	.....	.....	1.0	.3	[9]——	8.6	.....
3.5 Dealers and distributors	8.0	40.4	[4]3.5	[5]——	24.9	18.1	6.0	3.4	[9]31.0	44.7	.....
3.6 Customers[3]	2.0	0.8	[4]0.5	[5]0.8	14.1	.9	1.5	.....	[9]2.0	0.7	.....

[1] Chrysler Corp. includes Plymouth, Dodge, De Soto and Chrysler divisions. Ford Motor Co. includes Ford and Lincoln divisions. General Motors Corp. includes Buick, Cadillac-La Salle, Oldsmobile, Pontiac and Chevrolet divisions.

[2] Waterway traffic includes not only those shipments which are loaded directly on vessels at factories and assembly plants but also those which are transported by highway to the docks for the water line which issues the line-haul receipt or bill of lading.

[3] Customers are those who represent themselves as the ultimate purchasers of automobiles and go to the factories or assembly plants to take direct delivery of the cars they have purchased.

[4] Percentages apply to Ford plants only. Not furnished for Ford and Lincoln combined. Data for individual plants shown in another exhibit.

[5] Percentages apply to Chevrolet plants only. Not furnished for all General Motors Corp. plants combined. Data for individual plants shown in another exhibit.

[5a] Represents shipments in manufacturers' equipment only, i. e., private carrier.

[6] Data for Hupp Motor Car Corp. not included as that manufacturer was excused from reporting on account of being in process of reorganization.

[7] Does not include 1,217 automobiles shipped out by highway carriers whose status was unknown.

[8] Does not include 1,217 automobiles shipped out by highway carriers whose status was unknown nor 1,495 automobiles shipped out by American Bantam in its own equipment.

[9] Percentages apply only to facilities at South Bend, Ind., excluding those at Los Angeles, Calif.

Co. **Frank P. Morrow,** who has been located in Detroit as district manager for Standard Alloy the past six years, has been appointed sales manager of the company.

J. Edward Schipper has been appointed zone supervisor of the American Automobile Association's Contest Board activities in the Detroit area, succeeding E. Von Hambach.

Curtis C. Stewart has been named regional manager of the National Motor Truck Show with headquarters at the Navy Pier in Chicago.

John S. Maloney has resigned as consulting engineer and designer of air conditioning and fuel dispensing equipment for the Gilbert & Barker Mfg. Co. to accept the position of research and project engineer for the Chandler-Evans Corp., Meriden, Conn.

Verne H. Donnelly has established the Donnelly Export Co., which will specialize in the exporting of automotive parts, accessories and equipment to the Hawaiian Islands and the Pacific Far East. Headquarters of the new company will be in the Central Tower Building in San Francisco, Calif.

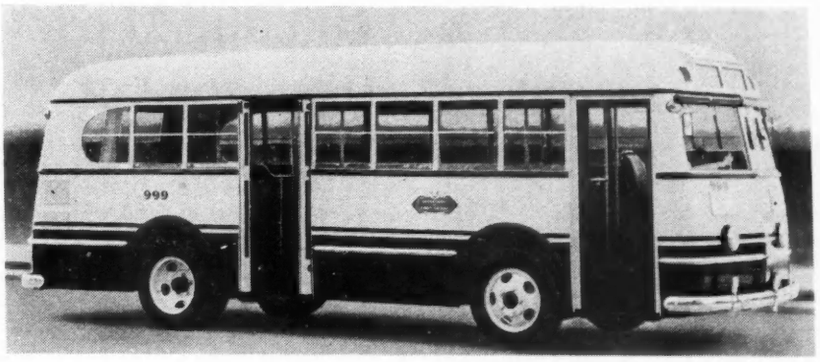
Leon F. Banigan, former automotive business paper editor and merchandising executive, has been named managing director of the National Council of Private Motor Truck Owners. Appointed by the Council's executive committee, he will take over his new duties early in September at headquarters to be established in Washington, D. C.

Joseph E. Bayne has been promoted to the position of assistant general sales manager of the Plymouth Division of Chrysler Corp.

Joseph D. Burke, who resigned as director of truck sales, Dodge Division of Chrysler Corp. last March, has been named vice-president in charge of sales of the Federal Motor Truck Co. **K. M. Schaefer** will continue as general sales manager for the Federal organization.

An All-Time Record For Perfect Circle

The Perfect Circle Co., Hagerstown, Ind., reports that it has sold more piston rings for replacement in the first seven months of 1939 than in any other first seven months in its history.



Ford Rear-Engined Bus

This new Ford bus, recently announced, has its 95 hp. V-8 engine mounted transversely at the rear. Radiator grille opening is on the left side; air for the carburetor is taken in through a duct at the rear roof line. Engine fan is mounted on the crankshaft where it also assists in cooling the crankcase. Body panel construction is entirely of metal. Welded steel framing is covered with heavy gage aluminum paneling for sides and ends up to the window line. Above the window line steel is used for pillars and window frames.

Small Eastern Mills Benefit by Steel Wage Case Court Decision

Ourselves and Government—A Check List Of Federal Action Corrected to Aug. 23

DEPARTMENT OF LABOR

STEEL WAGE CASE. The temporary restraining order prohibiting the Secretary of Labor from enforcing her minimum wage-order under the Walsh-Healey Public Contracts Act for the steel industry has been continued in effect by the Court of Appeals for the District of Columbia pending further proceedings before the Federal District Court. The action represents a victory for the seven small independent steel mills in the East which, under the terms of the order, would have been forced to pay the minimum wage of 62.5 cents prescribed for companies in the East. Counsel for the mills contended that the Labor Department exceeded its authority, and the Court of Appeals, deciding that their complaint states a valid cause of action, remanded the case to the lower court.

The result is that all members of the industry, which, under the order, would be forced to pay minimum rates ranging from 62.5 cents in the East to 45 cents in the South, can continue to bid for and receive government orders without adhering to the steel wage order.

FEDERAL TRADE COMMISSION

VS GENERAL MOTORS. Rebuttal testimony by respondent to continue in Washington on Sept. 17. Case involves FTC allegation that GM dealers are required to handle GM parts to the exclusion of others.

SIX PER CENT CASE. Final arguments completed in both Ford and GM cases involving the FTC charge that the two companies allegedly engaged in false and misleading representations in finance plan advertising. Cases now before the Commission for decision, which may be forthcoming shortly.

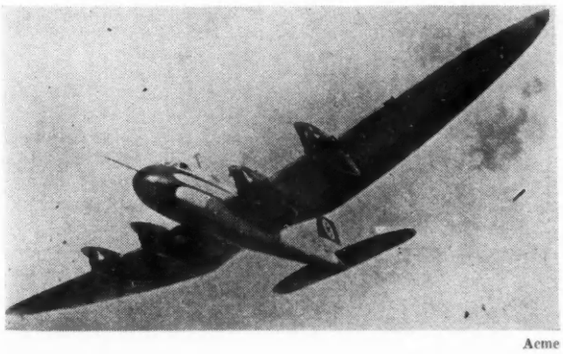
F. O. B. PRICE CASE. Testimony in GM case closed. Hearing in Ford case scheduled for Sept. 19. The FTC alleges that both companies engaged in misleading price advertising.

FAIR TRADE PRACTICE RULES. (No developments.)

INTERSTATE COMMERCE COMMISSION

The Commission has launched a general investigation of rail and water class rates and of freight classifications by rail and water in an effort to bring the freight rate structure up to date by prescribing "such rates and classifications as may be found justified." Class

(*Turn to page* 238, *please*)



Acme

Breaks Record

This is a German Heinkel four-engined plane of the type which recently set a new world's record in 10,000 kilometer distance flying and altitude flying.

Acme

Cobb Sets New Record

John Cobb (left), English business man, on Aug. 23 drove his 2600 hp. Railton Red Lion car over the Bonneville Salt Flats, Utah, to a new speed mark of 368.85 m.p.h. for the measured mile and 369.74 for the kilometer. Shown with him is John H. Weiser, of the Gilmore Oil Co., who sponsored the successful attempt.

Increase of 68% Over '38 In July Rim Inspections

Total number of rims inspected and approved during July by the Tire & Rim Association, Inc., totaled 681,434, an increase of approximately 68 per cent over July a year ago. For the first seven months of 1939 the rims inspected and approved aggregated 9,179,797, an increase of about 106 per cent above the comparable period in 1938.

100,000 Mark Goal of 1940 Inaugural of "Volkswagen"

German Government Decree to Reduce Different Types Of Automotive Parts and Accessories by 86 Per Cent

Assistant American Trade Commissioner Paul H. Pearson has reported to the Commerce Department from Berlin that first deliveries of the new German "people's car," Volkswagen, are expected to be made in 1940 when production of 100,000 units is scheduled. At the same time it was reported that administrative regulations just issued to the German automotive industry will greatly reduce the number of types of parts and accessories manufactured.

Construction of the automobile plant at Fallersleben is rapidly nearing completion and the production figure of 100,000 for the year 1940 will be increased to 200,000 units in 1941 and 250,000 in 1942, according to the report. Since the so-called saving plan for purchasing the new model was inaugurated 10 months ago, 253,000 subscribers have indicated their intention of buying but indicative of the sharp decrease in prospects in the past eight months is the report that 150,000 persons subscribed to the car purchase plan during the first two months. Factory price of the car will be approximately $395, or 990 Reichmarks.

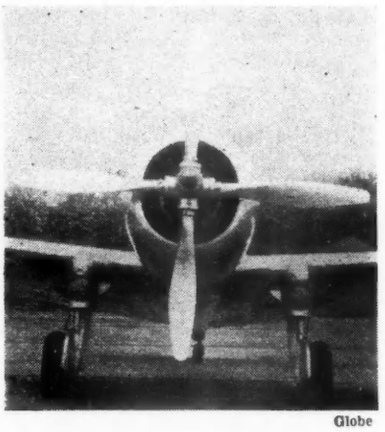
The German automotive standards just decreed affect some 128 different kinds of parts and accessories now manufactured in 5380 types. These types will be reduced to 739, a decrease of 86 per cent.

The new standards will reduce the number of types of complete generator sets from 164 to 27; self-starters, 123 to 10; gear boxes, 114 to 2; fuses, 15 to 3; spark plugs, 35 to 5; headlights, 76 to 15; bulbs, 269 to 26; tail and stop lights, 82 to 23; light switches, 44 to 3; ignition switches, 16 to 1; dimming switches, 20 to 3; traffic indicator switcher, 38 to 2; horn buttons, 22 to 2; carburetors, 212 to 19; radiator petcocks, 15 to 2; hydraulic brake cylinders, 122 to 10; oil pressure gages, 25 to 2; catseyes, 50 to 1; fuel line shut-offs, 50 to 1; and speedometers, 215 to 7.

Standardization moves recently taken in Germany's automobile industry will be followed in the manufacture of motorcycles, the Automotive-Aeronautics Trade Division of the Commerce Department reports. Proceeding on the theory that multiplication of types has resulted in uneconomic competition, the German government is planning to reduce the 150 types of motorcycles to 29, with the greatest concentration of types to take place in the light motorcycle class. Motorcycle parts and accessories also will be reduced in number under the plan.

Studebaker Reports Second-Quarter Profit

A net profit of $717,400 for the second quarter of 1939 is reported by the Studebaker corporation as against a net loss of $868,009 for the same period last year. For the first six months of 1939, Studebaker's net profit of $774,314 compared with a net loss of $1,940,360 for the first half of 1938.



Globe

Four Blades

A close-up of the new four-bladed controllable propeller, developed by the Curtiss Propeller Division of the Curtiss-Wright Corp. with the aid of the U. S. Army Air Corps. It is said that the new propeller absorbs greater power than the conventional three-bladed type of the same diameter and thus makes unnecessary any enlargement of propeller diameter proportionate with power increases which would require larger, heavier landing gear to afford the required ground clearance.

New Truck Registrations

	June 1939	May 1939	June 1938	SIX MONTHS 1939	SIX MONTHS 1938	Per Cent Change, 6 Months 1939 over 1938	Per Cent of Total Six Months 1939	Per Cent of Total Six Months 1938
Chevrolet	14,049	15,899	10,034	88,883	65,123	+ 36.2	35.73	33.23
Ford	10,606	11,706	8,510	65,459	54,567	+ 20.0	26.31	27.83
International	5,105	5,359	4,136	30,677	27,273	+ 12.6	12.33	13.91
Dodge	4,442	5,185	3,095	27,057	19,599	+ 37.8	10.87	10.00
G. M. C.	2,740	3,215	1,762	16,572	10,769	+ 54.0	6.66	5.49
Plymouth	889	1,118	692	4,928	4,220	+ 16.8	1.98	2.15
Mack	588	666	321	3,168	1,911	+ 66.0	1.27	.97
Diamond T	408	427	340	2,431	2,241	+ 8.4	.98	1.14
White	434	426	275	2,204	1,816	+ 21.1	.89	.93
Studebaker	209	196	159	1,080	1,041	+ 3.8	.43	.53
Autocar	162	184	235	922	883	+ 4.5	.37	.45
Brockway	177	177	116	886	609	+ 45.8	.36	.31
Willys-Overland	185	166	197	829	1,045	− 20.6	.33	.53
Divco	90	160	120	781	608	+ 28.8	.31	.31
Reo	53	78	224	740	1,471	− 49.7	.30	.75
Federal	123	173	97	734	694	+ 5.8	.29	.35
Bantam	50	56		275			.11	
Hudson	47	44	67	274	478	− 42.6	.11	.24
Sterling	25	45	21	165	114	+ 44.8	.07	.06
Indiana	12	16	38	106	242	− 56.2	.04	.12
F. W. D.	10	12	23	83	182	− 54.4	.03	.09
Miscellaneous	78	73	185	572	1,181	− 51.5	.23	.61
Total	40,482	45,381	30,647	248,826	196,067	+ 27.0	100.00	100.00

AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity

BUSES Virtually no variation noted in rate of manufacturing operations which for one of the leading producers is close to the 60 per cent capacity mark. A number of distributors in the East report lull in deliveries during the past two months as compared with the same period last year.

TRUCKS Production schedules generally remain better than seasonal but do not approach factory capacities. One large manufacturer has not varied five per cent during the last 90 days.

TRACTORS Production and sales are at the low point of the year. The manufacturers who have announced new models are getting into production. Due to high cost of building cabs, representing about 12 per cent of the tractor price, there appears to be some doubt as to ready acceptance of such models.

AUTOMOBILES Preliminary estimates of output for August indicate a total for the month of approximately 85,000 cars and trucks. Chevrolet, Ford and Plymouth are not expected to get into full swing on 1940 models until the latter part of September.

MARINE ENGINES The peak of marine engine business has passed and production is at low ebb. Several plants are closed for inventory.

AIRCRAFT ENGINES Additional government orders for aircraft, extra engines, and parts, together with the steady demand for private craft, are keeping the manufacturers on capacity production schedules.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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Exports of Aeronautic Products Since 1911 Totaled $297,778,314

U. S. Department of Commerce Survey Indicates Importance of Foreign Sales Since World War

Exports of aeronautic products in the 28-year period from July 1, 1911, to June 30, 1939, are valued by the Commerce Department at $297,778,314 and accounted for a large percentage of domestic production.

Exportation of about 28 per cent of the total domestic production of aeronautic products since the World War indicates strongly the importance of foreign markets for the products of the industry, the Department said. The survey shows that a total of 6450 units of aircraft valued at $148,631,635 have been sold abroad since July 1, 1911, when export records of aeronautic products were first begun. Foreign sales of aircraft engines since 1921, the first year in which such products were reported separately, numbered 12,964 valued at $41,394,202. Shipments abroad of parts since 1913, the first year of record, totaled $105,766,913.

Statistics included in the survey show that while exports were of importance to the industry during the period from 1916 to 1918, they first reached sizable proportions in 1934 when the trade was valued at $17,662,938. Exports during 1936, 1937 and 1938 established successive all-time new value records and the trade for the first six months of the current year, valued at $49,010,653, the largest valuation for any six months of record, evidences that a new record will be established during 1939.

The six months' trade of this year included 728 land planes valued at $30,086,094; engines numbering 827 valued at $5,775,171; and parts with a value of $12,316,787. United Kingdom, France, Netherlands India, Russia, Mexico, the Netherlands, and Argentina were the principal markets for the exports during the current year.

Imports of aeronautic products into the United States from 1912 to the end of May of this year were valued at $5,560,857.

World Motorcycle Output Up 11 Per Cent in 1938

World production of motorcycles and three-wheel motor vehicles is estimated at 407,725 units in 1938, an increase of 11 per cent compared with 1937, according to a survey of the Automotive-Aeronautic Trade Division, Department of Commerce. Motorcycle production has shown a steady increase since 1933, the department said, and the 1938 total was only 17 per cent less than for the record year of 1929 during which 494,712 units were recorded.

Increased production during 1938 was attributed to enlarged outputs by Germany, Hungary, Italy, Netherlands, Poland and Sweden. All other manufacturing countries produced less vehicles in 1938 than in 1937. Germany, the leading producer of motorcycles since 1934, was the first-ranking producer in 1938 with an output totaling 204,924 units. The United Kingdom was second with 65,000 units, followed by Sweden, 40,000; Italy, 24,600; Japan, 16,000; France, 13,722; and the United States, 13,201.

Exports of motorcycles from the United States totaled 3505 units valued at $989,076 in 1938 compared with 3438 units valued at $930,170 in 1937, according to the Automotive-Aeronautics Division, Department of Commerce. A world survey of production and exports of motorcycles made public shows that Canada with purchases of 714 motorcycles valued at $190,032 was the principal foreign outlet for American-made motorcycles during 1938.

Germany was again the leading world exporter of motorcycles during 1938 with total foreign shipments numbering 41,607 units, or 20 per cent of domestic production. Exports from the United Kingdom decreased from 25,251 units in 1937 to 19,769 units in 1938.

Acme

Mass Meeting of Aerial Might

An impressive view of the bomber, pursuit and attack planes which were displayed publicly by the U. S. Army Air Corps at Wright Field, Dayton, Ohio, during the recent celebration of the thirtieth anniversary of the purchase of the first plane by the United States Army.

New Car Registrations and Estimated Dollar Volume by Retail Price Classes*

	JUNE, 1939		FIRST SIX MONTHS, 1939			
	Units	Dollar Volume	Units	Per Cent of Total	Dollar Volume	Per Cent of Total
Chevrolet, Ford and Plymouth	134,323	$98,200,000	783,304	55.61	$573,600,000	48.06
Others under $1,000	88,728	81,000,000	497,980	35.35	457,300,000	38.31
$1,001 to $1,500	16,652	19,300,000	106,206	7.54	123,700,000	10.36
$1,501 to $2,000	2,657	4,100,000	14,032	1.00	21,700,000	1.82
$2,001 to $3,000	1,146	2,600,000	6,598	.47	15,100,000	1.27
$3,001 and over	95	400,000	478	.03	2,200,000	.18
Total	243,601	$205,600,000	1,408,598	100.00	$1,193,600,000	100.00
Miscellaneous	140		504			
Total	243,741	$205,600,000	1,409,102			

* All calculations are based on delivered price at factory of five-passenger, four-door sedan, in conjunction with actua new car registrations of each model. The total dollar volumes are then consolidated by price classes.

U. S. Exports of Metal-Working Machinery Hit All-Time High

Figures for the First Six Months of 1939 Show Japan Replacing Soviet Union as Chief Purchaser

Exports of metal working machinery continued to rise during the first six months of 1939, reaching the all-time value of $55,685,450 as compared with $51,557,933 for the corresponding period of 1938. The Machinery Division of the Department of Commerce reported that Japan, the chief purchaser, replaced the Soviet Union, which was the most important market for United States metal working machinery in 1938. Shipments to Japan increased from $13,237,230 in the first six months of 1938 to $14,723,809 in the same period of 1939. Exports to Manchuria showed an even greater rise, from $237,690 in 1938 to $1,486,786 in 1939. Together, Japan and Manchuria took almost 30 per cent of the United States exports of metal working machinery in the period under review, or about 15 per cent of the total United States production.

Exports to the United Kingdom rose sharply from $8,134,495 in the first six months of 1938 to $12,267,511 in the first half of 1939. The United Kingdom by the end of 1939, may again be the outstanding market for this equipment, the Department said, noting that May and June shipments to the United Kingdom were greater than to Japan.

Metal working machinery exports to the Soviet Union dropped from $16,077,369 in the first half of 1938 to $9,776,201 in the first six months of 1939. The 1938 shipments to Russia set a record high which may not be equaled for some time. Last year Germany, previously the chief supplier of machinery to Russia, was unable to make deliveries of machinery wanted by the Russians with the result that American sales rose to record heights. However, there is now some indication that Germany is again in a position to supply this market, and, in fact, several large Russian orders have recently gone to German firms, the Department said.

Shipments of metal working machinery to France during the January-June period jumped to $7,892,988 as compared with only $2,218,515 in the same period of last year. On the basis of reports from the machine tool industry concerning foreign orders, it is expected that shipments to France will increase for some time to come. It was pointed out by the Machinery Division that shipments to the four chief markets, Japan (including Manchuria), United Kingdom, Soviet Union, and France, accounted for 82.9 per cent of the total United States exports of metal working machinery for the first half of this year.

Edward J. Connolly

Edward J. Connolly, president of Hayes Body Corp., Grand Rapids, Mich., died of a heart attack while playing golf on Aug. 20. Connolly, who had been president of the company since last May, had previously served as a vice-president and had served on the board of directors since 1929.

Acme

For Antarctic Duty

Ten feet in diameter and weighing 700 lbs., this huge tire will be used on the giant snow cruiser (AUTOMOTIVE INDUSTRIES, August 1, page 128) of the forthcoming U. S. Antarctic Expedition under the command of Admiral Richard Byrd. The tire is the first of six to be built by the Goodyear company.

Contrasting a standard tire with the giant are (left to right): Dr. H. T. Heald, president, Armour Institute of Technology; Dr. Thomas C. Poulter, designer of the cruiser and second in command of the expedition, and Paul Litchfield, president of Goodyear.

Consumption of Crude Rubber Drops 7.1%

Consumption of crude rubber by manufacturers in the United States during the month of July, 1939, totaled approximately 43,880 long tons, a decrease of 7.1 per cent under June, but 28.2 per cent over July a year ago, according to statistics released by The Rubber Manufacturers Association, Inc.

Gross imports of crude rubber in July totaled 36,739 long tons, an increase of 2.2 per cent over June, and 60.3 per cent over July, 1938.

The association estimated total domestic stocks of crude rubber on hand July 31 at 174,240 long tons, which compared with June 30 stocks of 181,794 long tons and 282,785 (revised) long tons on hand July 31, 1938.

Crude rubber afloat to United States

Estimated Dealer Stocks of New Passenger Cars

1938	July	August	September	October	November	December
Production—U. S. Domestic Market †	96,975	53,955	60,177	171,371	295,366	305,900
Retail Sales—U. S.‡	153,426	123,711	90,629	134,984	241,009	241,623
Change in Inventory	−56,451	−69,756	−30,452	+36,387	+54,357	+64,277
Inventory, first of month	263,618	207,167	137,411	106,959	143,346	197,703
1939	**January**	**February**	**March**	**April**	**May**	**June**
Production—U. S. Domestic Market †	263,225	223,745	279,148	257,058	222,909	233,311
Retail Sales—U. S.‡	180,651	165,841	276,301	265,756	275,457	254,304
Change in Inventory	+82,574	+57,904	+2,847	−8,698	−52,548	−20,993
Inventory, first of month	261,980	344,554	402,458	405,305	396,607	344,059
1939 (continued)	**July**	**August**	**September**	**October**	**November**	**December**
Production—U. S. Domestic Market †	.....	.....	.....	.....	.....	.....
Retail Sales—U. S.‡	.....	.....	.....	.....	.....	.....
Change in Inventory	.....	.....	.....	.....	.....	.....
Inventory, first of month	323,066	.....	.....	.....	.....	.....

†—U. S. Census Bureau. ‡—Automobile Manufacturers Association.

ports as of July 31 was estimated to be 52,990 long tons which compared with 51,274 long tons afloat on June 30 and 40,400 long tons afloat on July 31 a year ago.

July reclaimed rubber consumption was estimated at 13,542 long tons, production 12,588 long tons, stocks on hand July 31, 21,339 long tons.

PUBLICATIONS

No. 2 of the quarterly review **Tin and Its Uses** deals with tin research in America, electro-deposited tin coatings, a new alloy for condenser tubes, the 1939 Statistical Year Book, hot tinning, and canned foods in the British Empire. Copies may be obtained from the International Tin Research & Development Council, Fraser Road, Greenford, Middlesex, England.

A pamphlet entitled "Generatori di Oscillazioni e Vibrazioni Meccaniche—Fondamenti Teorici, Applicazioni e Costruzione," by Prof. Dr-Ing. Mario Tessarotto of Rome University is a reprint from L'Ingegnere of March 15, 1939. The pamphlet deals with mechanisms of the type of the **Lanchester anti-vibrator.**

"Saving and Investment in the American Enterprise System" is the title of a booklet published by the Machinery and Allied Products Institute, Chicago.

Uses for "Cavalon" **rubber-coated upholstery fabric** are described in a booklet issued by the "Fabrikoid" Division of the du Pont company.*

Joseph T. Ryerson & Son, Inc., has prepared a general data book which contains metallurgical definitions; heat, hardness and numerical equivalent tables; weight, dimension, and specific gravity tables; carbon steel, drill rod, non-ferrous, tubing, sheet, and manufacturing tolerances.

All types of **paper pulleys for industrial use** which are manufactured by the Rockwood Mfg. Co., Indianapolis, Ind., are described in the company's new booklet No. 860.*

A new size and weight listing of "Universal" **bronze bars** made by the Johnson Bronze Co., New Castle, Pa., has been issued in the form of a convenient reference chart.*

"Electrocolor," a process for producing colors on metal articles by electrolytic color plating, is described in a leaflet published by United Chromium, Inc., New York.*

The application of various types of **tractor-mounted** and **tractor-drawn equipment** to roadbuilding problems is the subject of the booklet "Roads to Profit" which has been issued by the Caterpillar Tractor Co., Peoria, Ill.*

The Electroplating Division of E. I. du Pont de Nemours & Co. has issued a technical service manual giving data on the preparation and use of **"Cadalyte" Bright Dip in cadmium plating.** The bulletin describes what "Cadalyte" Bright Dip does, the procedure for its use, the preparation of the solution, the operation, and the advantages claimed for it.*

Design data on the Morse round pin roller chain will be found in Bulletin 75 issued by the Morse Chain Co., Ithaca, N. Y. Other Morse **power transmission** products are also described.*

Stainless steel castings are the subject of a folder issued by the Atlas Stainless Steel Castings Division of Atlas Foundry Co., Irvington, N. J. The folder contains an extensive list of the many uses of this metal in various industries.*

The United Specialties Co., Holmesburg, Philadelphia, Pa., has issued its Catalog No. 12 which describes the company's line of Mitchell **dovetails** available for original and replacement equipment on automobile doors.*

*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Hudson Cuts Prices On Its 1940 Models

Hudson prices for 1940 will start at $670, delivered in Detroit. The new base price, for a Hudson Six coupe, is $25 lower than last year, and the 4-door sedan is priced at $763, which is $43 under the lowest priced 4-door sedan offered for 1939.

The new Hudson Super-Six 4-door sedan is $38 lower than the corresponding 1939 model. Prices of the Country Club series are also lower, and the Hudson straight Eight on 118-in. wheelbase, new this year, will start at $860 delivered in Detroit, with a 2-door sedan at $918 and 4-door sedan at $952.

Hudson base prices, delivered in Detroit, are: Hudson Six, $670; Hudson Six DeLuxe, $745; Hudson Super-Six, $809; Hudson Eight, $860; Hudson Country Club Six and Eight sedans, $1,018 and $1,118, respectively.

William Crossley

William Crossley, 58, New York zone manager for the Oldsmobile Division of General Motors, died Aug. 7 from complications that followed a heart attack.

You too can have this Valuable Data . . . FREE

Guide to Treatment Shipped with Steel

Thousands of steel buyers are now enjoying the time and money saving features of the Ryerson Certified Alloy Steel Plan. They get carefully selected alloys which have all hardening factors (analysis, grain size, etc.) within a very narrow range. With every shipment, large or small, Ryerson sends accurate data on heat treatment response, and chemical and physical properties. There is no need to test, or experiment in order to secure desired results. You too can have this valuable data. It is given without additional cost or obligation. Simply specify Ryerson Certified Alloy Steels on your next requisition. Immediate Shipment will be made from large and complete stocks of these accurately identified, known quality steels. Ryerson Certified Steels also include carbon, tool and stainless steels. Write for the Ryerson Stock List, which gives data on all Ryerson Certified Steels.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, Philadelphia, St. Louis, Cincinnati, Detroit, Cleveland, Boston, Buffalo, Jersey City.

RYERSON CERTIFIED STEELS

RYERSON

New Headlighting System

(*Continued from page 229*)

wholly interchangeable and will fit equally the highest and lowest priced automobiles equipped with the system.

The new lamps throw two light beams. The first, for universal use on lighted city and town streets and on the highway wherever there is movement of other vehicles, is known as the "Traffic Beam." This is virtually a no-glare beam. Its characteristics include a wide distribution of light to the sides of the road, with sharp, clear illumination up the right shoulder, without causing uncomfortable glare to oncoming drivers.

The second, or upper beam, is named the "Country Beam." For use only on the open highway when there is no traffic whatever, it throws its light a considerably greater distance down the road than former types. It bathes road shoulders, warning signs, fences and curves in light, and also permits the driver to see overhanging obstacles such as branches, overpasses and the like. While the difference in road illumination between these two beams is quite pronounced, in addition, as part of the new light system, cars will have on the instrument panel a signal which will glow red as long as the "Country Beam" is in use.

The hand need not be moved from the steering wheel to change from traffic to country beam or back again. The familiar foot switch at the extreme left of the floor board will be the sole control for changing the beam. The usual light switch on the instrument panel will have only two positions: the first to turn on parking and signal lights; the second to turn on the headlights.

The sealed beam headlamps will be manufactured by all the headlight producers as original equipment and for the replacement market. Differing in some details of construction, mechanically, electrically and optically, the products of all will, nevertheless, produce the same lighting result, and are wholly interchangeable.

At present, there is some doubt that owners of cars equipped with former-type lamps will find it practical to install sealed beam units. The multitude of sizes and shapes of the various prior-type lamp mountings, plus the question of heavier wiring and greater power output, place certain difficulties in the way, which yet remain to be worked out.

Back of the development occurred a long period of intensive study in which every automobile manufacturer and the lighting equipment makers contributed the knowledge gained through many years of research, and the time of their lighting engineers.

Three years ago an engineering committee, on which all passenger car makers were represented, undertook coordinated study. Primary reasons were the need for uniform results in better illumination, uniform equipment to simplify operation by the driver and adjustment at the service station, and adaptation of state regulations to the advanced standards of car lighting.

At the outset, the industry began consultation with the American Association of Motor Vehicle Administrators. To the advice and cooperation of this association's members through its engineering committee, the industry attributes in large measure the successful completion of the program. The authorities of several states which had differing regulations worked to adapt these to permit introduction of the new system.

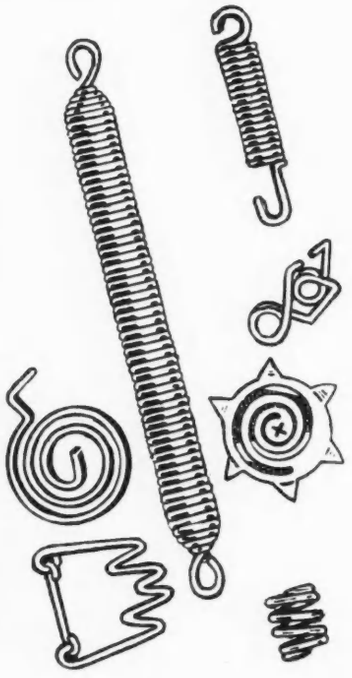
ACCURATE
is the name for
SPRINGS you
can depend* upon!

*you can depend on delivery when you want them . . .

*you can depend on performance when you get them . . .

IT means a lot to us — that reputation we have for dependability. We want to impress upon you these two facts: the finest springs in the world can't do you any good if they aren't in your plant when you need them, and good delivery service on springs means nothing if you can't depend on their quality.

Accurate means service and quality in springs — you can depend on that. If you haven't already found it out — let us quote on your requirements. You'll be glad.



ACCURATE SPRING MANUFACTURING CO.
3811 West Lake Street Chicago, Ill.

Car Fires Result in 11½ Per Cent of Alarms

Results of a survey made by the International Association of Fire Chiefs among 426 cities in all population groups indicate that 11.53 per cent of all legitimate alarms in 1938 were for car fires.

40 YEARS AGO

Three Wheelers

"Various attempts have been made both here and abroad to construct three-wheeled motor carriages that should prove as reliable on the road as four-wheeled vehicles. The saving of the differential gear and the fourth wheel and axle is a strong inducement to the inventor to adopt this form of construction. Lighter weight and lower cost, however, are obtained by the sacrifice of something more important than either in a motor vehicle—stability. The single drive wheel has a tendency to slew on wet roads or greasy pavements, resulting not infrequently in an overturn."

From *The Horseless Age*, September, 1899.

Seven Months' Car Output In Canada 8% Below '38

Automobile production in Canada during July amounted to 9135 units, of which 2415 were made for sale in Canada and 6720 were for export. In July last year output was 9007 cars including 4114 for home use and 4893 for export.

Output in July was made up of 5112 passenger cars of which 603 were for sale in Canada and 4509 for export and 4023 trucks and buses of which 1812 were for the Canadian market and 2211 for export.

Cumulative production of all cars for this year to July 31, amounted to 102,890 units or 8 per cent less than the total of 111,165 cars made during the corresponding seven months of 1938. This year's output included 63,774 cars for sale in Canada and 39,116 for export against 75,248 for home market and 35,917 for export in corresponding period of 1938.

GM's July Overseas Sales Slightly Ahead of 1938

Sales of General Motors cars and trucks to dealers in the overseas markets during July totaled 28,663 units, representing a slight increase over sales in July of last year.

In the first seven months of 1939, sales of 223,171 units represented an increase of 1.4 per cent over sales in the first seven months of 1938.

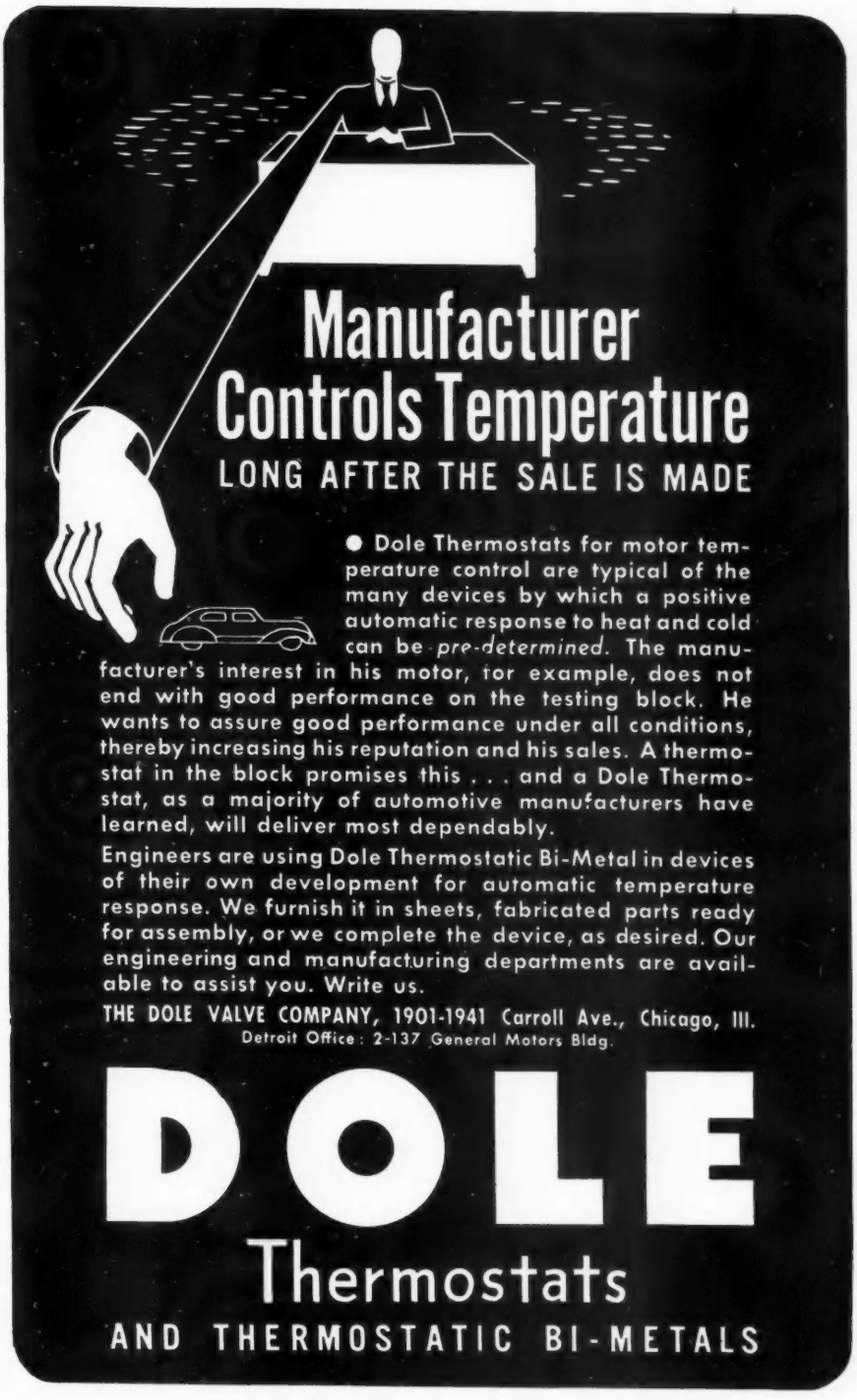
R. Hoe & Co. Establishes New Industrial Division

R. Hoe & Co., Inc., principally known as a manufacturer of large printing presses, has announced the formation of a new industrial division which has under consideration an extensive program for diversifying the company's products. First work scheduled to the shops under the new arrangement was produced for the aviation industry.

Wright Aeronautical, Air Associates, and Sperry Gyroscope are among the companies which have engaged R. Hoe & Co. to produce such products as: Housings, crankcases, propeller brake drums, jigs and fixtures. This company also has received its first educational orders from the War Department specifying the manufacture of recoil mechanisms to be used on anti-aircraft gun mounts.

Correction

In the article on "Corrosion Resistance of Aluminum Cylinder Heads," by L. W. Kempf and M. W. Daugherty, which appeared on pp. 156 *et seq.* of the August 15 issue of AUTOMOTIVE INDUSTRIES, a considerable amount of text material intended to follow at the end of the second column on p. 159 was inadvertently omitted in the printing process. Reprints of the article, including the complete text, are in preparation and may be obtained on request from the Aluminum Association, 420 Lexington Ave., New York.


Manufacturer
Controls Temperature
LONG AFTER THE SALE IS MADE
● Dole Thermostats for motor temperature control are typical of the many devices by which a positive automatic response to heat and cold can be *pre-determined*. The manufacturer's interest in his motor, for example, does not end with good performance on the testing block. He wants to assure good performance under all conditions, thereby increasing his reputation and his sales. A thermostat in the block promises this . . . and a Dole Thermostat, as a majority of automotive manufacturers have learned, will deliver most dependably.
Engineers are using Dole Thermostatic Bi-Metal in devices of their own development for automatic temperature response. We furnish it in sheets, fabricated parts ready for assembly, or we complete the device, as desired. Our engineering and manufacturing departments are available to assist you. Write us.
THE DOLE VALVE COMPANY, 1901-1941 Carroll Ave., Chicago, Ill.
Detroit Office: 2-137 General Motors Bldg.
DOLE
Thermostats
AND THERMOSTATIC BI-METALS

URWA Seeks Government Aid In Fight Against Tire Price Cuts

Attempt to Obtain Federal Intervention Made on Eve of Rumored Lauching of 25%-Off Sale by Big Producers

The United Rubber Workers Union of America, an affiliate of the C.I.O. will seek Federal intervention to prevent price warring among tire manufacturers and mass distributors, Sherman H. Dalrymple, international president, announced in Akron, Aug. 20, on the eve of the rumored launching of 25 per cent cut price sales by leading tire companies. The special 25 per cent off sales, applied to all tire lines, were scheduled to become effective Aug. 22 and to continue through Labor Day.

Declaring that the special price sales were absolutely without justification, Dalrymple announced that he and Thomas F. Burns, vice president of the URWA, and Stanley Denlinger, URWA counsel, would go to Washington and personally petition the Federal Trade Commission and Department of Justice to intervene.

"There is absolutely no justification for this price cut," Dalrymple stated. "The very size of the cut indicates that it is not done for any sound economic reasons, but is dictated by a desire of the big manufacturers to cut the ground out from under the smaller companies.

Tire industry circles are still echoing repercussions of the pre-Fourth-of-July price sale as result of which numerous manufacturers and their store managers are under indictment in several states for alleged misrepresentation in advertising. Following this price debacle the Rubber Manufacturers Association rounded up manufacturers at Lake Placid, N. Y., and succeeded in getting their unanimous indorsement of a resolution guaranteeing there would be no repitition of the unsavory and allegedly misleading tire advertising.

The first price sale, launched June 19, carried through July 4 and affected third- and fourth-line tires only. The second sale, from mid-July to Aug. 1, affected only second-line tires. The new price sale scheduled to run from Aug. 22 through Sept. 4, will apply to all lines.

It is reported that manufacturers have issued to their dealers special discount schedules to apply during the sale. The extra discounts will range from 7½ per cent on first and second lines to 10 per cent on third lines and fourth lines, and 7½ per cent on inner tubes.

The industry had its best first half year since 1931, with consumer sales exceeding 16,500,000. On the strength of the sales which were more than one-third larger than in the same period of 1938, the industry anticipates total replacement sales for 1939 of more than 36,500,000 units.

This year has seen more general price cutting than the industry has had for more than six years, the series of price sales having virtually demoralized the industry's price stabilization program which, until last July, apparently had been working with full effectiveness.

Smaller manufacturers say they cannot afford to cut prices, but may be forced to do so to remain competitive.

Ourselves and Government

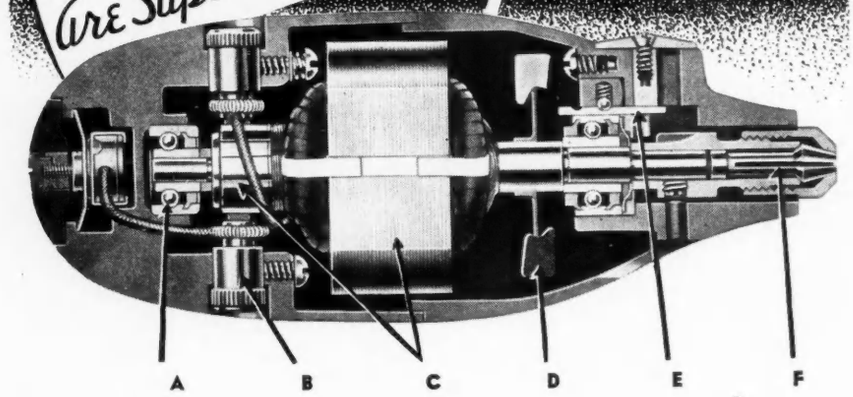
(*Continued from page* 231)

rates—rates applicable to all shipments not moving under commodity rates—will be under scrutiny by the ICC except in mountain-Pacific territory where, it was indicated, the class rate structure has not been a subject of complaint, and on transcontinental traffic.

Subscription of motor for railroad

Examine the Construction—See Why They Are Superior

DURO Heavy Duty GRINDER



A

The New Departure precision type Ball Bearings are permanently sealed. Note the bearing dimensions and bearing support. Extra wide ball bearings, supporting the armature at both ends, and heavy mounting sustains the radial load and takes up all end thrust. Proper mounting of high speed units is vital.

B

Square cartridge type brushes for maximum seating capacity and A-1 performance.

C

The conventional type series wound motor provides better performance, more economical operation, longer life and greater power output.

Standard commutators with machined V grooves and steel clamping rings such as are used on Electric Drills. Brushes ride on the periphery—not on the end—thus affording proper commutation and longer life.

D

Propeller type fan pulls large volume of air through and over all workparts for COOL and efficient operation.

E

Patented Lock. Button pushes forward and pin slides into groove in chuck locking it securely.

F

Threaded type collet chuck is compact, yet strong. Overhangs end of Tool only 5/16". Collets are tempered steel.

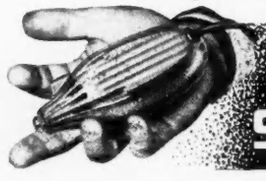
These and many other features such as precision machining throughout, machined rabbet fit in the housing and the General Electric Motor running at 24,000 R.P.M. and developing over 40 watts output prove the superiority and unsurpassed value of this Grinder. Do not confuse watts output with watts input. Watts output is the power developed at the spindle. Watts input is the power consumed.

The Duro Heavy Duty Grinder is built for production use in the tool room or shop. It has the power, speed and durability for the most exacting service. Send for complete literature or send for the Heavy Duty Grinder on our ten-day trial money back guarantee. Price $14.95.

Manufactured by
The Makers of America's Finest and Most Complete line of Power Driven Machinery.

DURO METAL PRODUCTS CO.

Dept. PT-8 2663 N. Kildare Ave., Chicago, Illinois



LONG ON QUALITY
STRONG ON PERFORMANCE

service between points will be prohibited after Dec. 6, 1939, the ICC has just held, unless the rail carrier using its own trucks or the participating contract motor carrier has been authorized to operate as a common carrier. Application for such authority must be made within 30 days after the decision. Railroads using motor carrier service in line-haul movements directed to publish tariffs covering service between points.

TEMPORARY NATIONAL ECONOMIC COMMITTEE

Discounts allowed on quantity purchases allowed the automotive and other large consuming industries will be given considerable attention, it is reported, at the steel hearings to be resumed about Oct. 15, when the Department of Justice will present what is said will be the most comprehensive study ever made of the iron and steel industry. There is said to have been complaints that allowances made to buyers of large lots of steel work to the undue disadvantage of the smaller buyers. It has been stated that the matter will be developed and that in the meantime no conclusions have been reached as to the merit of complaints. The TNEC steel study by the Department will last about two weeks. Later the steel industry will be permitted to present its case.

N.S.P.A.'s July Sales Index Down 4% from June

The automotive sales index, prepared by the National Standard Parts Association, showed a slight decline in July of 4 per cent as compared with the preceding month, although it stood 17 per cent above June, 1938. Average monthly sales for the first seven months maintained their position at 143, 23 per cent above the same period for 1938.

Replacement parts shipped to wholesalers in July, reports the N.S.P.A., declined 11 per cent below June but still held a position 19 per cent above July a year ago. The monthly average is 22 per cent above the first seven months of 1938.

Shop equipment and tools shipped to wholesalers in July declined only 1 per cent, but this was 14 per cent above July, 1938. Average monthly sales for the period were 14 per cent above last year.

Original equipment shipped to vehicle manufacturers in July is revealed by the N.S.P.A. report to have declined 8 per cent from June. However, July was 31 per cent above the same month last year. The monthly average for the first seven months was 168, or 50 per cent higher than seven months of 1938.

Export shipments in July showed an increase of 1 per cent but dropped 3 per cent below last July. The average for the first seven months of this year registered 11 per cent ahead of the same period last year.

Voting Trust Urged in Reorganization of Reo

Latest plans for reorganization of the Reo Motor Car Co., as submitted to the U. S. District Court in Detroit by counsel for Theodore I. Fry, call for establishment of a three-man voting trust which it was said would consolidate management, eliminate controversy on the board of directors and pave the way for favorable action by the Reconstruction Finance Corp. on the company's application for a loan of from $1,500,000 to $2,000,000.

Judge Arthur F. Lederle, in whose court the reorganization proceedings are being held, instructed the Securities and Exchange Commission to make a detailed report on the proposed voting trust plan for submission to the court at the next hearing set for Sept. 11. At a hearing on Aug. 14 the trustee's proposal was opposed by counsel for a majority group of stockholders but his motion for dismissal was denied by the court, with entry of the denial postponed until briefs by both sides had been filed.

Under the trustee's reorganization plan the capital structure of the company would be reduced to approximate-

(*Turn to page 247, please*)

"You're lucky, Mister, it's a Schrader Valve so I can seal it with a cap or, if you can give me just a minute, I'll put in a new core and your tire valve will be as good as new. You see, with this type valve you can fix it without ripping the whole tire off. There, I've fixed it while I was talking. You can go now . . . just a nickel each for the new cap and core."

A. Schrader's Son Brooklyn, N. Y.
Division of Scovill Manufacturing Company, Incorporated

Schrader
REG. U.S. PAT. OFF.
TIRE VALVES

TRADE ADVANTAGES

The interchangeability of Schrader Tire Valve parts reduces delays in tire and vehicle servicing and simplifies the inventory problem for the entire trade.

THE STANDARD FOR EQUIPMENT AND REPLACEMENT

LETTERS

Editor, AUTOMOTIVE INDUSTRIES:

Since the beginning of the automobile industry the trend always has been to increase gear-tooth loadings. This will immediately become apparent by comparing the small-size gearsets used in 1939 models with those in use 20, 15 or even 10 years ago. When consideration is given to the vast improvement in engine ability during the same period, the decrease in gearset proportions is even more significant.

Owing to this trend, conditions now existing in the lubricant distribution field must be carefully weighed. It is my belief that relatively few automobile engineers have a clear view of petroleum marketing conditions, and it is my desire to present to the automobile industry some of the economic facts involved in gear-lubricant distribution.

There are in the United States approximately 400,000 filling stations. Many states have passed so-called "chain-store" tax legislation that imposes unbearable penalties on multiple ownership of filling stations. For this reason large oil companies have been compelled to relinquish ownership and control over their outlets to less responsible hands. In addition, there are many filling stations that have never been under the direction or supervision of a responsible oil company. Mail-order houses, small oil jobbers, and even some grocery stores, retail lubricants without the benefit of guidance of accurate technical knowledge.

Many filling stations are in the hands of persons having limited financial resources. They not only resent the need and refuse to carry a multiplicity of gear lubricants, but many lack the capital necessary to stock even a reasonable variety. Metered dispensing units are required by law in most states, and these devices cost from $15 to $25 per unit. In the past such equipment was furnished to company owned stations by oil companies. It will be noted that the cost to the nation's filling stations for dispensing equipment only, for one special lubricant, will be eight-million dollars or more.

A survey made by the Valvoline Co., about two years ago, of the stocks carried in oil stations of all so-called "must" lubricants, showed that an unbelievably small percentage of stations had a complete line. A surprisingly large number did not stock any form of extreme-pressure lubricant.

The introduction of hypoid gears in high-volume passenger-car production in 1936 necessitated widespread distribution of a special lubricant for their proper lubrication. The automotive industry insisted that only a special type was satisfactory for this service. Major oil companies gave their unanimous and wholehearted support, by distributing this special lubricant. However, a recent survey of petroleum-marketing practice indicates that over 25 per cent of hypoid gear sets have been lubricated by the filling station with so-called mild E.P. lubricants. Owing to the fact that average-owner driving habits are not as severe as proving-ground routine, comparatively little trouble has resulted from this practice. This experience plus the economy of reducing the variety of lubricants stocked, has stimulated a demand in the petroleum industry for an "all-purpose" gear lubricant; that is, a lubricant satisfactory for use in hypoid rear axles of both passenger cars and commercial vehicles, as well as in all other types of gearing used in automotive practice. The demand gained strength recently when a large concern adopted hypoid gears for its commercial vehicles. Owing to the high temperatures generated in severe commercial service, lead-active sulphur lubricants become too active chemically in that type of service.

It has been demonstrated that lubricants of sufficient chemical activity to carry the full load on the S.A.E. machine at 1000 r.p.m. will result in a very high wear rate in service. This wear is correctly described as chemical erosion of the gear faces. It is occasioned by continuously high temperatures between the gear teeth, which al-

ONLY LAPPING *As Strom Does It*
CAN PRODUCE SUCH PRECISION

Strom Steel Balls possess a degree of surface smoothness and sphericity that has never been equalled in any other regular grade of ball. Such precision is exclusive with Strom because it can be attained only through a series of lapping operations such as are standard practice in the Strom plant.

Physical soundness, correct hardness, size accuracy and sphericity are guaranteed in all Strom Balls.

Other types of balls—*stainless steel, monel, brass* and bronze, are also available in all standard sizes. Write for complete details.

Strom STEEL BALL CO.
1850 So. 54th Avenue, Cicero, Ill.
The largest independent and exclusive Metal Ball Manufacturer

ways accompany sustained high-torque operation.

The service operating conditions of passenger-car and commercial-vehicle hypoid rear axles are not similar. Modern passenger cars have so much excess power that they cannot be operated at maximum torque in intermediate gear ratios for more than brief periods. Commercial vehicles, on the contrary, are frequently run in low gear at maximum torque for miles at a stretch. There is a great difference between percentages of maximum available torque ordinarily employed in commercial vehicles and in passenger cars, and this difference has an important bearing on the type of lubricant that may be used. In passenger-car axles we can successfully use extreme-pressure lubricants having a high degree of chemical activity, while in commercial vehicles such a lubricant is very apt to progressively destroy the gearset under heavy load conditions.

The oil industry faces the possibility that it may be called upon to distribute for gear lubrication purposes:

(a) Straight mineral oils in all S.A.E. grades.

(b) Mild E.P. lubricants in all S.A.E. grades.

(c) Special passenger-car hypoid lubricants in S.A.E. 80 and 90 grades.

(d) Special commercial-car hypoid lubricants in S.A.E. 80 and 90 grades.

If such a variety of products were available in filling stations it is inevitable that improper lubricants would be served in many cases. With a suitable "all-purpose" lubricant, any chance of dispensing the wrong lubricant would vanish. The reduction in dispensing equipment would be welcomed. A condition satisfactory to both the automotive and oil industries would prevail.

General acceptance of the "all-purpose" lubricant has been widely predicted by most of the oil industry. It is believed that an adequate "all-purpose" gear lubricant will finally supplant the present multifarious types because the responsible oil companies have lost control of filling stations. Serving improper or harmful lubricants will be eliminated and greater marketing economy and efficiency must ensue.

The automotive engineering fraternity should have an accurate picture of this situation, because of its importance in determining future tooth loadings. It should be borne in mind that even if all the major oil companies agreed to provide ultra-powerful E.P. lubricants—or any other specialty—they are now utterly powerless to ensure its distribution and stocking at their own filling stations. This is a very significant fact which must constantly be borne in mind. Many filling stations have flatly refused to stock special hypoid lubricants. They are vitally interested in reducing the number of lubricants carried in stock.

If designers of passenger-car gearsets in the future bring out designs which will operate successfully only on an ultra-powerful extreme-pressure lubricant, trouble will inevitably be encountered in the field. Even if the entire petroleum industry were united and desired to furnish a special lubricant to meet such a design, the effort would be futile. It is simply not possibly of accomplishment in an important part of 400,000 filling stations. To the mind of the average human being a hypoid gear is a hypoid gear, whether in a truck or a passenger car. The notion that it might be possible to accomplish the distribution of a "truck-poid" lubricant, and a "passenger-poid" lubricant is obviously in the realm of the impractical. Gear-teeth proportions in the future should be based on the "all-purpose" type of gear lubricant. Due to its decreased chemical activity it will possess greater stability and less abrasive tendencies under conditions of high temperature, heavy load conditions, than present-day hypoid lubricants.

It is hoped that the automotive engineering fraternity will appreciate this truth, for its own benefit, as well as for that of the lubrication industry.

ROBERT K. FLOYD, *President,*
Frank Harris Floyd, Inc.,
Lubrication Engineers,
Detroit, Mich.

LOW COST DRILL PRESSES ARE SAVING THOUSANDS OF DOLLARS

Delta sensitive drill presses that cost less than $50.00 are doing work today that $150 drills would not handle a few years ago! They're not merely new tools—but a *new type* of tools. Their first cost is less—from 50% to 75% lower than old type machines. Their maintenance cost is less—they require less power, less attention because of their sealed-for-life ball bearings and V-belt drives. They are flexible and in most cases portable. They can be moved around to fill in "waiting time" and meet changes in the production line. They can be adapted economically for special set-ups for special jobs.

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DRILL PRESS BOOK
It contains specifications and prices of complete line of Delta Drill Presses.

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MOTOR DICTIONARY. *A Complete Dictionary of Motor Terms in Three Languages. Second Edition. By Benno R. Dierfeld. Vol. II, English-French-German. Published by Massie Publishing Company of London and distributed in the U. S. by Chemical Publishing Co., Inc., 148 Lafayette Street, New York.*

This is the second volume of the dictionary by Mr. Dierfeld, in which the English terms are arranged alphabetically. In the first volume, which was reviewed in these columns some time ago, the German terms appeared in alphabetical order. The second edition, which follows the first after about nine years, has been considerably enlarged and includes terms relating to front-wheel drive, independent suspension, automotive Diesel engines, gas generators, and other subjects that have come to the fore in automotive engineering during the past decade. Some six thousand terms are in the dictionary.

Industrial Market Data Handbook

An "Industrial Market Data Handbook," which the Commerce Department hopes will guide business in establishing new sales territories or reappraising old ones, was put on sale last week at $2.50 a copy. The handbook, the first of its kind to be published by the government, contains data on industrial production, employment, value of products, cost of material, fuel and power and output per wage-earner by counties and large cities for 1935.

Prepared as a cooperative study by the Bureau of Foreign and Domestic Commerce, the Census Bureau, and the Bureau of Mines, the handbook is being boomed by the Commerce Department as useful for setting up sales and production quotas, planning sales and advertising campaigns, and deciding on channels of distribution "likely to be most profitable to the manufacturer."

Tin Handbook

The 1939 edition of the Statistical Year Book of the International Tin Research and Development Council, compiled by the Council's statistical office at The Hague, has just been published. From this Year Book one may trace the development of the world's tin industry from an output of about 8000 long tons a year in 1800 to over 208,000 tons in 1937. The reduced demand in 1938 brought world output to 148,400 tons—nearly 29 per cent lower than in 1937. The principal producers in 1938 were British Malaya, 43,247 tons; Bolivia, 25,371 tons, and the Netherlands East Indies, 21,024 tons.

The Year Book, which is fully illustrated by graphs, contains about 200 pages size 10½ by 8 in., and may be obtained from the International Tin Research and Development Council, Fraser Road, Greenford, Middlesex, England, at the price of 8 shillings per copy, post free.

Aircraft Display For SAE Meeting

An aircraft engineering display will be a feature of the Society of Automotive Engineers' National Aircraft Production Meeting in Los Angeles, Oct. 5, 6 and 7, John A. C. Warner, SAE secretary and general manager, announced when he disclosed the fact that the site of the meeting will be the Hotel Biltmore instead of the Ambassador Hotel as originally contemplated.

The new display will furnish a meeting place for examination and discussion of the newest products of the aircraft supply industries. It is being developed, Mr. Warner stated, at the request of the leading aircraft engineers and executives who have participated actively in these SAE national aircraft production meetings since their inception in 1936.

J. H. Kindelberger, president, North American Aviation Corp., heads the committee under whose auspices the display will be operated. Mac Short, president, Vega Airplane Co., is general chairman for the meeting as a whole.

P&H TRAV-LIFT CRANES

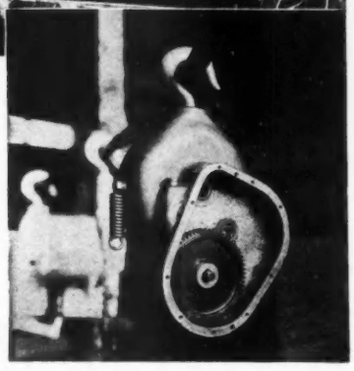
In Automotive Shops

● The moving of heavy parts around your shop becomes the simple matter of pushing buttons when you use a P&H Trav-Lift. Designed for intermittent service, these units offer you the advantages of low cost, easy operation and great flexibility in handling loads up to 15 tons. They are described in Bulletin H-13. Harnischfeger Corporation, 4559 West National Avenue, Milwaukee, Wisconsin.

HARNISCHFEGER CORPORATION

HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

NEEDLE BEARING MEETS ALL REQUIREMENTS IN THE "*BUDGIT" HOIST



(*Above*) The Needle Bearing is quickly installed on a production basis, using a tool developed by Shaw-Box engineers to speed up assembly line.

(*Left*) Here is the popular "Budgit" Hoist in operation on the job, with the Torrington Needle Bearing at work under heavy loads.

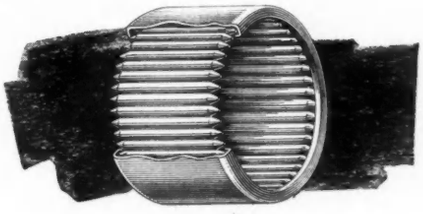
(*Right*) Two of the Needle Bearings are seen in place on a partly assembled hoist on the production line.

"HERE are the engineering problems we solved with the Torrington Needle Bearing," say the makers of the well-known "Budgit" Hoists:

"High load carrying capacity and small size for mounting in a limited space.
"Installation with the minimum of 'fussing'.
"Positive lubrication without special provision, and lubrication for long periods without attention.
"Reasonable cost."

Check this list of bearing requirements prepared by the engineers of Shaw-Box Crane & Hoist, and see how it compares with bearing problems on your own product. And check them with the design features of the Needle Bearing: a full complement of small-diameter rollers to give ample radial capacity; small size in proportion to rating; compact unit design for easy installation; thorough, efficient lubrication provided by a large reservoir for lubricant; cost of bearing and installation surprisingly low. Because of these features, the designers of the "Budgit" Hoist found that *only* the Torrington Needle Bearing met all their bearing requirements.

Our Engineering Department will be glad to show you how easily you can



meet similar engineering problems by incorporating the Needle Bearing in your own designs. Because of its small diameter and compact design, the Needle Bearing is readily adaptable to even the simplest type of housing. In fact, its use often makes possible the simplification of present housing designs, with consequent savings in weight, space, and cost.

For further information on the Torrington Needle Bearing, write for Catalog No. 7. For Needle Bearings to be used in heavier service, request Booklet No. 103X from our associate, Bantam Bearings Corporation, South Bend, Ind.

** Trade Mark Reg. U. S. Pat. Off.*

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.
Makers of Ball and Needle Bearings
Branch Offices in all Principal Cities

TORRINGTON
NEEDLE BEARING

Car Financing Volume Down 2.3% in June

Dollar volume of retail automobile financing for June, 1939, amounted to $138,571,907, according to the Bureau of the Census, Department of Commerce. The figure represents a decrease of 2.3 per cent when compared with May, 1939, an increase of 49.3 per cent as compared with June, 1938, and a decrease of 28.5 per cent as compared with June, 1937.

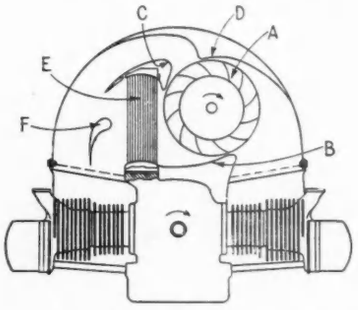
The Bureau reports that the volume of wholesale financing for June, 1939, amounted to $122,684,294, a decrease of 15.7 per cent when compared with May, 1939, an increase of 65.3 per cent compared with June, 1938, and a decrease of 32 per cent as compared with June, 1937.

ABSTRACTS

German Volkswagen

One of the features of the powerplant of the German Volkswagen is its oil cooler, details of which have just become public through the issuance of a British patent on it. The accompanying drawing, reproduced from *The Automobile Engineer*, shows the arrangement.

The engine, as is generally known, is a four-cylinder, opposed, air-cooled design, and a centrifugal fan is provided to produce the cooling blast. The air blast produced by the fan A is divided into three currents by the guiding surfaces, B, C, and D. The oil cooler D, mounted directly on the crankcase, receives one of these currents, and the faces of its top and bottom tanks are suitably shaped to form



Porsche cooling system for air-cooled engine

a continuation of the guide surfaces, this minimizing the resistance to flow.

After passing through the cooler, the air is divided by the guide F and one part is delivered to the cylinder barrel, while the remainder, together with the second current, is supplied to the cylinder head. The third current cools both the barrel and the head of the opposite cylinder or cylinders.

Men and Machines

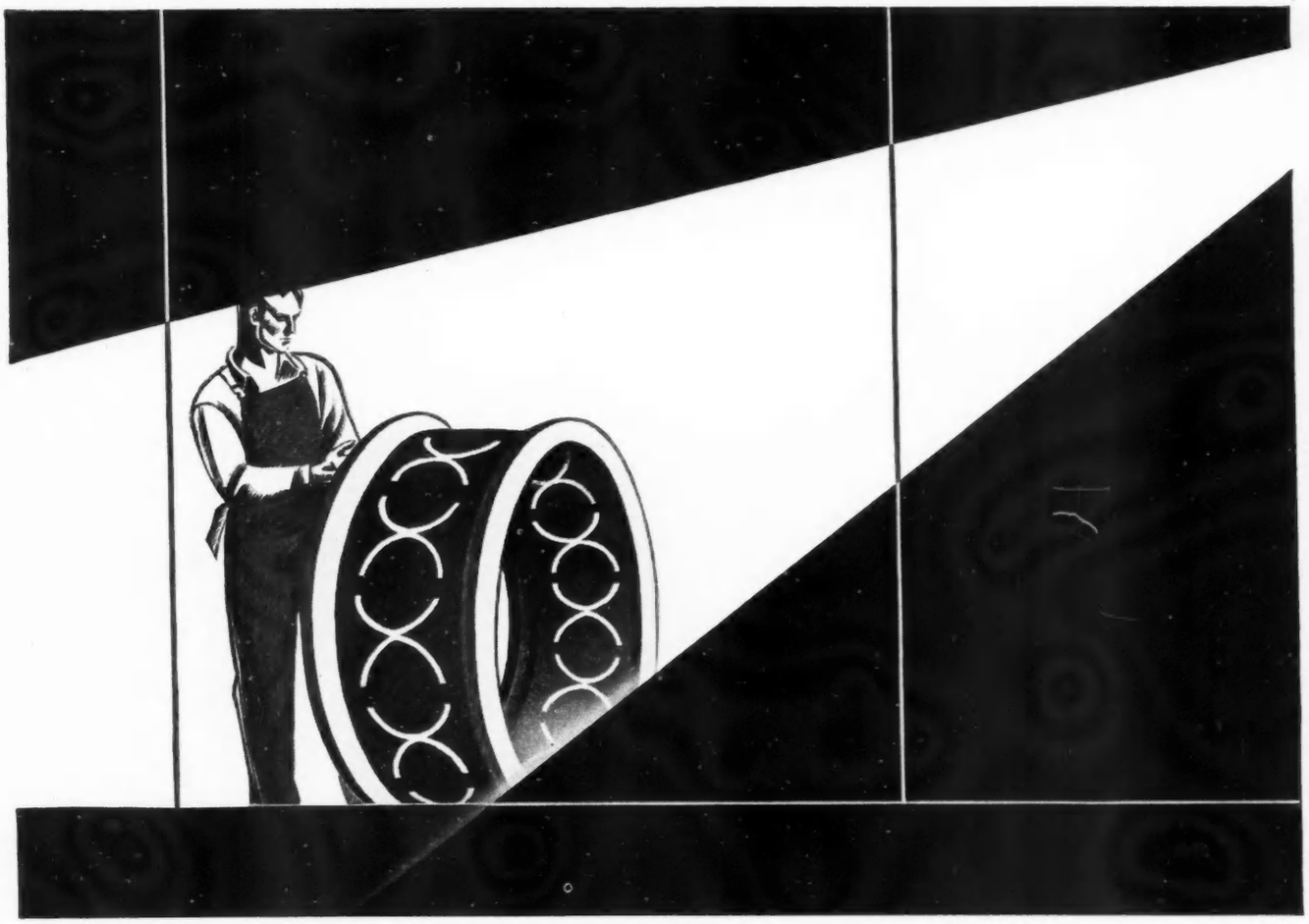
(*Continued from page* 212)

Duty. . . . A new line of industrial trucks with hydraulic elevating tables developed by the Lyon Iron Works, Greene, N. Y. . . . Danly Machine Specialties, Inc.'s, new and enlarged line of precision die sets in a wide range of sizes of regular, reverse and long narrow die sets for any die from 3 in. by 3 in., to 25 in. by 14 in., in many thickness combinations of die holder and punch-holder. Included also are a new "Square" series of back post sets for mounting square and round dies, also in a complete range of sizes from 3 in. by 3 in., to 14 in. by 14 in. . . . A rotary air grinder for small wheel work, known as the Thor "Bantam," announced by the Independent Pneumatic Tool Co. It is only 5½ in. long and weighs 18 oz. . . . Another addition to the line of completely automatic plastic molding machines, product of the F. J. Stokes Machine Co., which is rated 15 tons, will produce moldings requiring up to 18 tons pressure and mold parts up to 4 in. in height, 6 in. in length and 19 sq. in. projected area. A feature of this machine is an adjustable bolster to reduce the length of ram travel and thus increase production rates on shallow work.—H. E. B., Jr.

A Silent Command

THE smooth, cushioned silence of Morse Timing Chains insures performance qualities obtainable with no other form of timing drive. Leading automotive engineers have for years relied on Morse Drives to bring out the best in their engine designs.

Morse Chain Co.
Ithaca, N. Y. Detroit, Mich.
Division, Borg-Warner Corporation



MEETING THE UNUSUAL...

Exceptional service requirements bring unusual problems, demand modern materials.

Consider, for example, the case of a manufacturer of textile braiding machines. Two cylindrical carrier head castings made unusual demands. They are 5 feet in diameter, weigh 850 and 1450 pounds respectively and have curved slots in which the carriers travel at high speed. Therefore unusual wear resistance was required. Furthermore, in addition to high strength, extreme accuracy in the finished casting and freedom from strains was essential.

The manufacturer found exactly the required physical and fabrication qualities in Chrome-Molybdenum Cast Iron—the necessary hardness and strength, good machineability and dependable response to stress relief treatment after machining.

Rechecking your own material specifications may disclose places where Molybdenum Iron will produce better results, or lower costs, or both. Our technical book, "Molybdenum in Cast Iron", will be sent free on request to production executives and engineers interested in better iron.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue, New York City

MOLY

Tool Engineers' Meeting Program

The American Society of Tool Engineers, Inc., has announced the following program for its meetings, to be held Oct. 5 and 6, in Cleveland, as a part of the Machine Tool Congress coincident with the Machine Tool Show.

Thursday, Oct. 5

Cleveland Engineering Society quarters, Guild Hall, 8:00 p. m.

Chairman: G. J. Hawkey, chairman, Cleveland Chapter A. S. T. E.

"Application and use of Anti-Friction Bearings as Applied to Machine Tools," Stanley R. Thomas, chief engineer, Bantam Bearings Corp., South Bend, Ind.

"Application and Use of Plain Bearings as Applied to Machine Tools," Eugene Bouton, supv. time study, J. I. Case Tractor Works, Racine, Wis.

"Bearings—Their Use and Misuse," Karl L. Hermann, engineer, South Bend, Ind.

Friday, Oct. 6

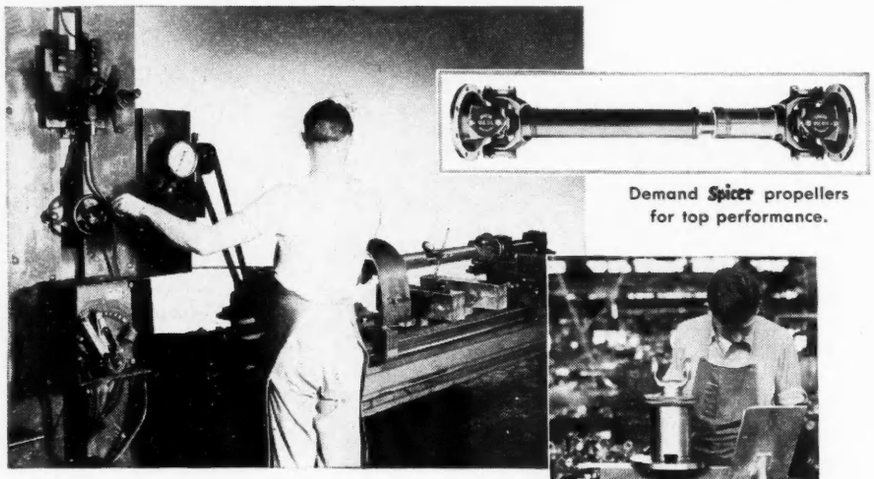
Dinner meeting, Hotel Statler Ball Room, 6:30 p. m.

Chairman: James R. Weaver, president A. S. T. E.

Second Report of Fact Finding Committee on "Effect of the Development of the Machine on Employment and Our Standard of Living," John R. Younger, professor, Dept. of Industrial Engineering, Ohio State University; chairman of A. S. T. E. Fact Finding Committee.

"Economic and Political Effect of the Development of the Machine," Hon. Hamilton Fish, United States Congressman from New York.

DOUBLE-CHECKING BALANCE FOR PEAK PROPELLER PERFORMANCE!



Demand Spicer propellers for top performance.

Checking Spicer propeller balance up to desired r.p.m.

Static balancing a Spicer end yoke.

To meet the exacting demands of customers for smooth-running performance and continuous service, propeller equipment must have balance. Every Spicer propeller has it—because of two meticulous Spicer tests.

All Spicer end and flange yokes must pass a rigid check for static balance. The close Spicer tolerances assure complete static balance control . . . Complete Spicer propeller units are given a speed balancing test, up to specified r.p.m. Again, rigorous specifications must be met.

These are more reasons why you can rely on Spicer Equipment for peak performance on the job. That's why leaders specify Spicer.

Spicer SERVICE TESTED LABORATORY TESTED

Spicer Manufacturing Corporation • Toledo, Ohio

BROWN-LIPE CLUTCHES and TRANSMISSIONS | SALISBURY FRONT and REAR AXLES | SPICER UNIVERSAL JOINTS | PARISH FRAMES READING, PA.

CALENDAR

Conventions and Meetings

National Petroleum Association, Annual Meeting, Atlantic City.Sept. 13-15
SAE Tractor Meeting, Hotel Schroeder, Milwaukee, Wis. .....Sept. 28-29
American Society of Tool Engineers Meeting, Cleveland .....Oct. 5-6
SAE National Aircraft Production Meeting, Hotel Biltmore, Los Angeles, Calif. .....Oct. 5-7
SAE Annual Dinner, Hotel Pennsylvania, New York, N. Y. .....Oct. 16
American Welding Society, Annual Meeting, Chicago .....Oct. 22-27
American Trucking Association, Annual Meeting, Chicago .....Oct. 23-24
SAE Transportation & Maintenance Meeting, Coronado Hotel, St. Louis, Mo. .....Oct. 26-27
SAE Fuels & Lubricants Meeting, Mayo Hotel, Tulsa, Okla.....Nov. 2-3
American Petroleum Institute, Annual Meeting, Chicago .....Nov. 13-17
National Independent Traffic League, Annual Meeting, Chicago....Nov. 23-24
Motor & Equipment Wholesalers Association, Annual Convention, Chicago .....Dec. 8-9
SAE Annual Meeting & Engineering Display, Book-Cadillac Hotel, Detroit .....Jan. 15-19, 1940

Shows at Home and Abroad

National Machine Tool Show, Cleveland .....Oct. 4-13
Great Britain, London, Automobile Show ..... Oct. 12-21
Rochester, N. Y., Automobile Show, Oct. 14-21
Indianapolis, Ind., Automobile Show, Oct. 15-21
Los Angeles, Cal., Automobile Show, Oct. 15-22
National Automobile Show, New York, Oct. 15-22
Newark, N. J., Automobile Show.Oct. 21-28
Baltimore, Md., Automobile Show, Oct. 21-28
Buffalo, N. Y., Automobile Show.Oct. 21-28
Detroit, Mich., Automobile Show.Oct. 21-28
Milwaukee, Wis., Automobile Show, Oct. 21-28
Pittsburgh, Pa., Automobile Show, Oct. 21-28
Toronto, Ont., Automobile Show..Oct. 21-28
St. Louis, Mo., Automobile Show.Oct. 22-28
National Metals Congress and Exposition, Chicago .....Oct. 23-27
Italy, Milan, Automobile Salon, Oct. 25 to Nov. 11
Philadelphia, Pa., Automobile Show, Oct. 26-Nov. 1
International Automobile, Motorcycle and Motor Boat Show, Budapest, Oct. 27 to Nov. 6
Great Britain, London, Commercial Automobile Transportation Show, Nov. 2-11
San Francisco, Cal., Automobile Show, Nov. 3-9
Chicago, Ill., Automobile Show...Nov. 4-12
National Truck Show, Chicago...Nov. 8-16
Great Britain, Glasgow, Scotch Automobile Show .....Nov. 10-18
Butte, Mont., Automobile Show....Dec. 4-5
Automotive Service Industries Show, Navy Pier, Chicago .....Dec. 11-16

Quantity Discount of "Different Sort" on Steel for 1940 Models

Metal Market Analysts Give New Label to Price Protection Afforded Automobile Manufacturers

Some steel market analysts see in the prevailing price set-up in the market for sheets and strip steel the introduction of a quantity discount of a different sort from that heretofore in vogue. That, they say, is what in the final analysis the price protection afforded to automobile manufacturers for their 1940 model requirements amounts to.

It is estimated that approximately one-half of all the sheets and strip steel rolled goes into automobiles. This concentrated consumption yields to steel producers certain advantages, especially long runs on one gage, grade and size, that few, if any, of the numerous miscellaneous outlets for sheets and strip steel make possible.

Quantity discounts in the steel market have been chiefly used to induce smaller consumers not to trim their orders too close. Until recently when quantity discounts on many steel products were abolished, an order for 150 tons assured the maximum discount on quite a few descriptions of steel. Tonnage buyers, such as the automobile manufacturers, whose orders are the chief prop of flat rolled steel production, running into millions of tons annually, constitute a class of buyers by themselves.

This appears to have been recognized in the prices named in May for their 1940 model flat rolled steel needs. It was pointed out recently that, while demand from what have come to be known as miscellaneous users had turned stronger and full prices were being paid by this class of buyers, this did not affect the takings of automobile manufacturers, who enjoy price protection. This, in effect, is nothing more than a quantity discount, based not on so many thousand tons, but on the steel consumption of automobile manufacturers as a whole, and taking into consideration their own marketing problems. It is interesting to note in this connection that the American Iron & Steel Institute reports annual capacity for the production of sheets to be more than 11,000,000 tons compared with 10,500,000 tons at the end of 1938 and 10,150,000 at the end of 1937.

Pig iron brokers and sellers report decidedly better demand for malleable iron from automotive foundries.

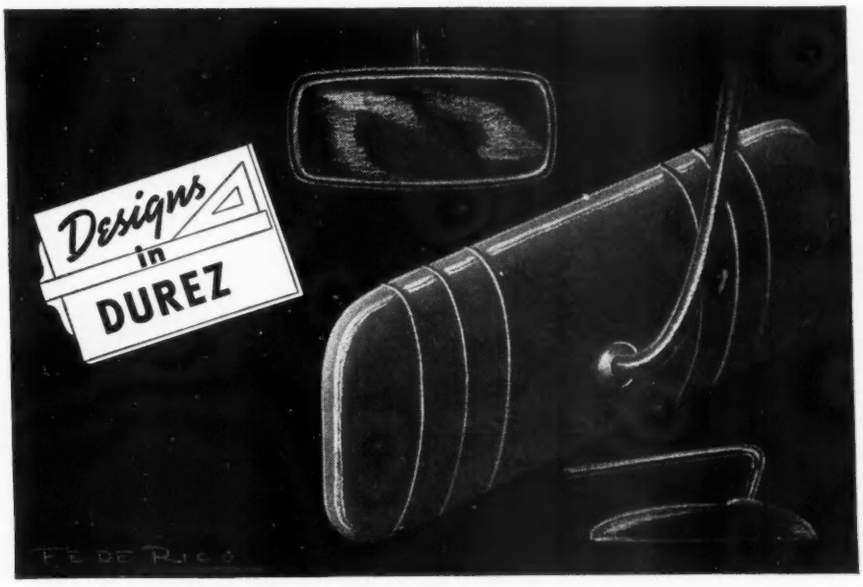
Connecticut brass mills are working at close to 75 per cent of capacity, much of the production consisting of automotive brasses for 1940 car models. Routine conditions prevail in the domestic copper market, where spot electrolytic continues to be quoted at 10½ cents, with some metal available in the open market at 10⅜ cents.

Tin was a shade firmer with spot Straits quoted at around 48.65 cents on Tuesday.—W. C. H.

Reo

(*Continued from page* 239)

ly $2,000,000 with new stock to be issued to all stockholders of record, share for share. Present shares outstanding total 1,800,000. Following this step an RFC loan of $1,500,000 to $2,000,000 would be asked for to tie in with a planned production and sale of 5000 heavy duty trucks during the first year. Col. Fred Glover, general manager, advised the court that the company could break even on such a program and that a schedule of 6500 trucks would produce a profit. Glover was asked to submit detailed production plans to the court at the Sept. 11 hearing.



Sketch for a REAR VISION MIRROR BACK

This month we bring you another arresting sketch from the board of Joseph B. Federico . . . a beautiful rear vision mirror back to be molded of lustrous Durez plastic.

Simply a suggestion, of course, but consider its possibilities! It could be molded and finished in one operation. It would have a permanently lustrous surface, would not dent, peel or chip. It could be produced in color to harmonize with car interiors. And it would be light and strong —to endure plenty of use and abuse.

Good idea—isn't it? And proves again how easy it is to find places where Durez can make your cars sparkle! For other suggestions, write . . .

Durez Plastics and Chemicals, Inc.
99 Walck Rd., N. Tonawanda, N. Y.

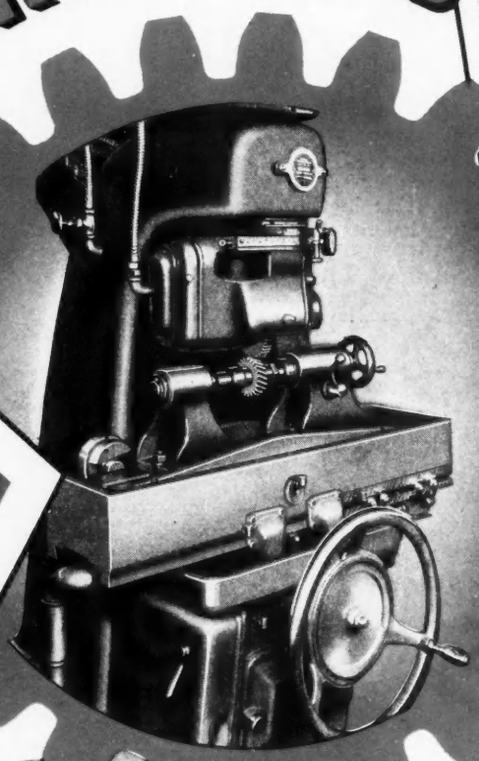
DUREZ PHENOLIC PLASTICS— AUTOMOTIVE FAVORITE FOR:

- Ash trays
- Cigar lighters
- Coil tops
- Control knobs
- Dashboards
- Distributor heads
- Glove compartments
- Hardware terminals
- Heater housings
- Horn buttons
- Radio grilles
- Rotors
- Shift lever knobs
- Spark plug shields
- Steering wheels
- Window and door trim

DUREZ PLASTICS THAT FIT THE JOB
DUREZ PLASTICS AND CHEMICALS, INC.

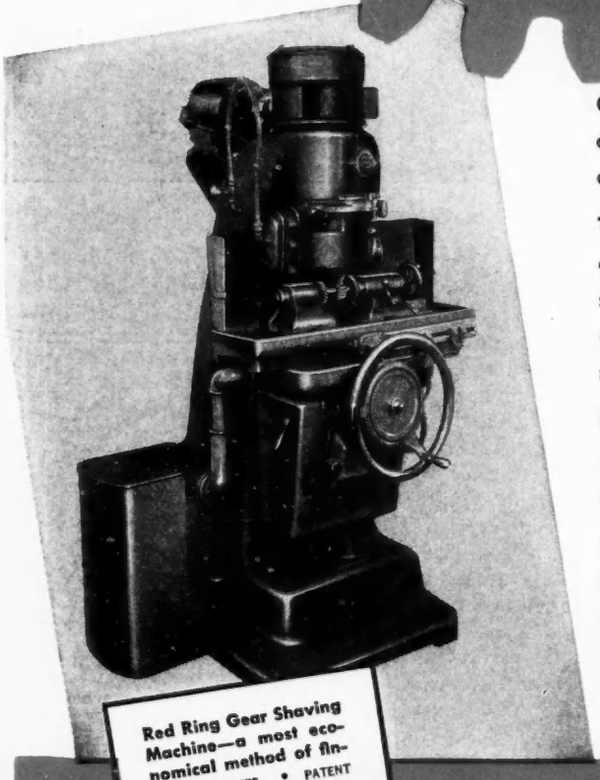
GEAR CROWNING

STOPS NOISE AND PROVIDES OTHER ADVANTAGES AT NO EXTRA COST



Single cam attachment which gives table slight rocking motion. This motion produces crowned teeth with no additional machine time. Cam can be locked in a parallel plane.

CROWNED SPUR GEAR TOOTH



Red Ring Gear Shaving Machine—a most economical method of finishing gears. • PATENT NUMBERS: 2126178, 1989650, 1989651, 1989652, 2111045, 2121479, 2157981.

One troublesome origin of noise in gear sets is due to contact on one edge. Such gear teeth are not parallel, either due to original misalignment or deflection.

The Red Ring Gear Shaving Machine equipped with the crowning attachment renders each tooth slightly barrel shaped. A pair of gears in mesh with one gear crowned will automatically develop adequate bearing, regardless of slight distortion or variations in alignment.

Effective on timing, transmission and certain types of reduction gears, this method of crowning requires no more machine time than conventional gear shaving on this machine.

Hence, crowning is available at *no extra cost*, except the initial cost of the crowning attachment.

Red Ring Gear Shaving, with or without crowning, is a faster, more economical, more accurate method of finishing gears.

WRITE FOR LITERATURE

NATIONAL BROACH AND MACHINE CO.

SHOEMAKER AND ST: JEAN • DETROIT, MICHIGAN